PGQP01

Entrance Test for the Course(s): B.Ed. (Education) [CUHAR], [CUJHD], [CUKNK]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the Teaching Aptitude.

PGQP02

Entrance Test for the Course(s): L.L.M. (Law) [CUHAR], [CUKER], [CUKNK], [CUPUN], [CUSBR], (Tribal and Customary Law/Human Rights) [CUJHD], (Law (Corporate Governance and Industrial Jurisprudence)) [CUTND]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

CONTRACT-I: GENERAL PRINCIPLES OF CONTRACTS

UNIT – I: History – Formation of Contract – Agreement and Contract – Definitions – Classification - Offerand Acceptance – Communication – Revocation – Essential elements – Invitation to Offer – Tenders.Consideration – Nudum Pactum - Essential elements – Privity of Contract and of Consideration –Exceptions – Unlawful Consideration and its effect. Contractual Ability – Electronic Documents as WebPages – Digital Certificates as Entry Passes – Time and Place of Contract – Secured Custody of ElectronicRecords.

UNIT – II: Capacity to Contract – Minor's Agreements and its effects – Persons of unsound mind– Persons disqualified by Law. Free Consent – Coercion - Undue influence – Misrepresentation – Fraud –Mistake – Legality of Object – Void Agreements – Agreements against Public Policy – Wagering Agreements – Its exceptions – Contingent Contracts.

UNIT – III: Discharge of Contracts and its various Modes – by performance – Time and place of performance – Performance of reciprocal promises - Appropriation of Payments – Discharge by Agreement – By operation of Law – By frustration (Impossibility of Performance) – By Breach (Anticipatory and Actual).

UNIT – IV: Remedies for Breach of Contracts – Damages – Remoteness of damages – Ascertainment of damages -Injunction – When granted and when refused– Restitution – Specific performance when granted – Quasi Contracts.

UNIT – V: The Specific Relief Act Nature of Specific Relief – Recovery of Possession of movable and immovable Property – Specific performance when granted and not granted – Who may obtain and against whom – Discretionary remedy – Power of Court to grant relief – Rectification of instruments – Cancellation – Declaratory decrees – Preventive relief – Temporary injunctions – Perpetual and Mandatory Injunctions. Government as a contracting party: Constitutional provisions – Government powers to contract – Procedural requirements – Kinds of Government Contracts, their usual clauses, performance of such contract, settlement of disputes and remedies.

CONSTITUTION

UNIT-I: Salient Features of the Indian Constitution, Preamble, Citizenship, Fundamental Rights.

UNIT-II: Directive Principles of State Policy, Fundamental Duties, Parliamentary Government, Bicameralism, Legislative Process, Privileges, Council of Ministers, President of India, Governor.

UNIT-III: Judicial process under the Constitution, Nature of Judicial Review, Judicial ReviewArts.32, 226 and 227, Court system in India, Judges- Appointments, conditions of service, etc., Advisory Jurisdiction of the Supreme Court, Public Interest Litigation, Activism v. Restraint.

UNIT-IV: Federalism, Center-State Relations, Freedom of Inter State Trade, Methods of Constitutional Amendment, Limitation on Constitutional Amendment.

UNIT-V: Emergency provisions, Services under the State, State Liability. Prescribed Books: Jain M.P. - Indian Constitutional Law. Reference Books: Seervai H.M. - Constitutional Law of India (3 Volumes). Shukla V.N. - Constitution of India. Basu D.D. - Shorter Constitution of India Basu D.D. - Shorter Constitution of India. Austin Granville - The Indian Constitution: Corner Stone of a Nation.

LAW OF TORTS

UNIT-I: Evolution of law of torts- Nature and scope of law of torts- Meaning- Torts distinguished from Contract- Crime- Development of Ubi jus ibi Remedium- Mental elements Intention, Motive, Malice in Law and in Fact.

UNIT-II: General Defences, Vicarious Liability.

UNIT-III: Negligence; Nuisance; Absolute and Strict liability. Legal Remedies-Awards-Remoteness of damage.

UNIT-IV: Torts against person: Torts affecting body- Assault, Battery, Mayhem and False Imprisonment; Torts affecting reputation-Libel and Slander, Torts affecting freedomMalicious Prosecution, Malicious Civil Action and Abuse of Legal Process; Torts affecting domestic and other rights-Marital Rights, Parental Rights, Rights to Service, Contractual Rights, Intimidation and Conspiracy; Torts against property.

UNIT- V: Consumer Protection Act, 1986

FAMILY LAW-I: HINDU LAW

UNIT – I: Introduction - Concept of Dharma - Sources of Hindu Law – Modern and Ancient - Importance of Dharma Shastra on Legislation – Two Principal Schools of Hindu Law - Application of Hindu Law.

UNIT – II: Marriage and Kinship - Evolution of the Institution of Marriage and Family- Law Prior to Hindu Marriage Act -A detailed study of Hindu Marriage Act, 1955 -Matrimonial

Remedies - Maintenance and Alimony; Customary Practices and legislative provisions relating to dowry prohibition.

UNIT – III: Hindu undivided family – Mitakshara Joint Family - Formation and Incidents - Property under both Schools – Kartha: His Position, Powers, Privileges and Obligations - Debts –Doctrine of Pious Obligation - Partition and Reunion –Religious and Charitable Endowment.

UNIT – IV: Inheritance and Succession - Historical perspective of traditional Hindu Law relating to Inheritance - A detailed study of Hindu Succession Act, 1956. Stridhana - Woman's Property - Recent State and Central Amendments to Hindu Succession Act; Gifts and Testamentary Succession – Wills.

UNIT – V: Law relating to Hindu Minority and Guardianship: Kinds of Guardians; Duties & Powers of Guardians; A detailed study of Hindu Adoption and Maintenance Act, 1956; Maintenance: Traditional Rights and Rights under Hindu Adoption & Maintenance Act 1956.

CRIMINAL LAW-I: INDIAN PENAL CODE

UNIT – I: General Principles of Crime; Conceptions of Crime; Distinction between Crime and other wrongs under common Law – Crime and morality distinction – Circumstances when morality amounts to crime - State's responsibility to detect, control and punish crime. Principles of criminal liability – Actus reus and mens rea (also statutory offences) and other maxims; Variations in liability – Mistake, intoxication, compulsion, legally abnormal persons; Possible parties to the crime: Principal in the I degree; Principal in the II degree; Accessories before the fact; Accessories after the fact. Indian Penal Code: General Explanation, Sections 6 – 33 and 39 – 52A; Punishment, Sections 53 – 75- social relevance of Capital Punishment - Alternatives to Capital Punishment - Discretion in awarding punishment and minimum punishment in respect of certain offences with relevance to precedents (judgments).

UNIT – II: General Exceptions: Sections 76 – 106; Criminal act by several persons or group: Sections 34 – 38; Abetment: Sections 107 – 120; Criminal Conspiracy: Sections 120A & 120B; Offences against State: Sections 121 – 130; Offences against the public tranquility: Sections 141 – 160; Offences relating to election: Sections 171A – 171; Contempt of lawful authority and public servants: Sections 172 – 190; False evidence and offences against public trust: Sections 172 – 229; Offences relating to coins and Government Stamps: Sections 230 – 263A; Offences relating to weights and measures: Sections 260 – 294A; Offences relating to religion: Section 295 – 298.

UNIT – III: Offences affecting human life, causing miscarriage, injuries to unborn children - Exposure of infants, concealment of birth - Hurt, Grievous Hurt - Wrongful restraint - Wrong confinement - Criminal force and Assault (Sections 299 – 358).

UNIT – IV: Kidnapping, Abduction - Slavery and forced labour – Rape: custodial rape, marital rape - Prevention of immoral traffic - Prevention of sati - Prohibition of indecent representation of women - Unnatural offences, theft, robbery and dacoity - Criminal Misappropriation of property - Criminal breach of trust - Receiving of stolen property – Cheating - Fraudulent deeds and disposition of property (Sections 378 – 424).

UNIT – V: Mischief (Sections 425 – 440) - Criminal Trespass (Sections 441 – 462) - Offences relating to document and property marks (Sections 463 – 480) - Offences relating to marriage (Sections 493 – 498 A) - Defamation (Sections 499 – 502); Criminal intimidation and annoyance and attempt to commit such offences (Sections 506 – 511).

CONTRACT-II

UNIT – I: Contract of Indemnity – Documents/Agreements of Indemnity - Definition, Nature and Scope - Rights of indemnity holder – Commencement of the indemnifier's liability – Contract of Guarantee – Definition, Nature and Scope – Difference between contract of indemnity and Guarantee – Rights of surety – Discharge of Surety – Extent of Surety's liability – Co-surety. Contract of Bailment – Definition – Kinds – Duties of Bailer and Bailee – Rights of Finder of goods as Bailee – Liability towards true owner – Rights to dispose off the goods. Contract of pledge – Definition – Comparison with Bailment – Rights and duties of Pawnor and Pawnee.

UNIT – II: Agency – Definition – Creation of Agency – Kinds of Agents – Distinction between Agent and Servant – Rights and Duties of Agent – Relation of Principal with third parties – Delegation – Duties and Rights of Agent – Extent of Agents authority – Personal liability of Agent – Termination of Agency.

UNIT – III: Indian Partnership Act – Definition – Nature, Mode of determining the existence of Partnership – Relation of Partner to one another – Rights and duties of partner – Relation of partners with third parties – Types of partners – Admission of partners – Retirement – Expulsion – Dissolution of Firm – Registration of Firms.

UNIT – IV: Sale of Goods Act – The Contract of sale – Conditions and Warranties – Passing of property – Transfer of title – Performance of the Contract – Rights of Unpaid Seller against goods – Remedies for Breach of Contract.

UNIT – V: Hire Purchase Act 1972 – Rights and Obligation of the Hirer and Owner, Form and contents of Hire Purchase Agreements, Warranties and Conditions - Standard Form of Contracts: Nature, Advantages – Unilateral Character, Principles of Protection against the possibility of exploitation – Judicial Approach to such Contracts – Exemption Clauses – Clash between two standard forms of contracts.

COMPANY LAW

UNIT – I: The Companies Act, 1956 – Corporate Personality and its kinds – Promoters – Registration and Incorporation – M O A.

UNIT – II: AOA – Prospectus – Directors – Meetings – Role of Company Secretary – Dividends; Brief analysis of corporate ethics.

UNIT – III: Issue of Shares – Types of Shares – Debentures – Procedure for allotment of shares and debentures – share capital – Rights and privileges of shareholders – Preventions of Oppression and Mismanagement – Different modes of winding up of companies.

UNIT – IV: SEBI Act, 1992; Securities Contracts (Regulation) Act, 1956 and Rules.

UNIT - V: FEMA Act, 1999; Competition Act, 2002; Brief introduction to BPO & LPO.

PROPERTY LAW

UNIT – I: General principles of Transfer of Property by Act of parties inter- vivos- Concept and meaning of immovable property- Transferable Immovable Property- Persons Competent to transfer - Operation of Transfer- Conditions restraining alienation and restrictions repugnant to the interest created- rule against perpetuity and exceptions- Direction for accumulation- Vested and Contingent interest.

UNIT – II: Doctrine of election- transfer by ostensible and co-owner- Apportionment- Priority of rights- Rent paid to holder under defective title- Improvements made by bonafide holder Doctrine of Lis pendens- Fraudulent transfer and part-performance.

UNIT – III: Mortgages of Immovable property: Definition- Kinds of mortgages and their features Rights and liabilities of mortgagor and mortgagee- Priority of securities- Marshalling and contribution- Charges.

UNIT – IV: Sale of immovable property: Rights and liabilities of seller and buyer before and after completion of sale- Difference between sale and contract for sale; Leases of immovable property: Definition- Scope- creation of lease- rights and liabilities of lessor and lessee Determination and holding over; Exchange: Definition and mode- Actionable Claims; Gifts: Scope- meaning- mode of transfer- universal gifts- onerous gifts.

UNIT – V: Law of Trusts with Fiduciary Relations: Definitions of Trust and its comparison with other relationships like Debt, Ownership, Bailment, Agency and Contract; Kinds of Trusts- Creation of Trust- Appointment of Trustees- Duties and Liabilities of Trustees Rights and Powers of Trustees- Disabilities of Trustee- Rights and Liabilities of the Beneficiary- Vacating the office of trustee and Extinction of Trusts.

ADMINISTRATIVE LAW

UNIT – I: Evolution- Nature and Scope of Administrative Law- Relation with Constitutional Law Separation of powers and concepts- Rule of law- Counsil d' Etate, (French system) - Classification of Administration Action- functions- Administrative direction and discretion.

UNIT –II: Legislative power of the administration- Extent of delegation and control over delegated Legislation- Sub-delegation- Judicial- Parliamentary control over delegated Legislation.

UNIT-III: Judicial power of Administration- Nature of procedure- Principles of Natural justice Effect of non-compliance with principles of Natural Justice- Exception to principles of Natural Justice.

UNIT – IV: Judicial control of Administrative action – Writs, Principles and Procedure - Public Law Review and Private Law Review of Administration action- Liability of State – Torts, Contract- Promissory Estoppel- Government Privileges- Right of information- Doctrine of Legitimate expectation- Doctrine of Accountability- Waiver- Doctrine of Proportionality. UNIT –V Corporations and Public undertaking- Commission of Enquiry- Ombudsman in India (Lokpal and Lokayuktha) - Central Vigilance Commission- Parliamentary CommitteesCivil services in India- Accountability and responsibility- Problems and ProspectivesAdministrative deviance- Corruption- Mal-administration- Control mechanism of Accountability.

FAMILY LAW –II: MOHAMMEDAN LAW AND INDIAN SUCCESSION ACT

UNIT-I: Development of Islamic Law: Advent of Islam & development of Muslim Law, Schools of Islamic Law, the Shariat Act, 1937; Concept of Marriage: Definition, object, nature, essential requirements of a Muslim marriage, classification of marriage - Legal effects of valid, void and irregular marriage - Muta marriage; Sources of Islamic law; Customary practices and State regulation: Polygamy; Child marriage; Pre-emption; Wakf; Dower.

UNIT-II: Conversion and its consequences on family: Marriage, Guardianship, Succession; Child and Family: Legitimacy, Custody, maintenance and education, Guardianship and parental rights.

UNIT-III: Matrimonial Remedies under Islamic Law and Indian Divorce Act, 1869 (Amended Act) - Nullity of marriage - Bar to matrimonial relief; Alimony and Maintenance: Alimony and Maintenance as an independent remedy- A review under Muslim law, Indian Divorce Act,1869, provisions under the Criminal Procedure Code, 1973; Maintenance of divorced Muslim Women under the Muslim Women (Protection of Rights on Divorce) Act, 1986.

UNIT-IV: Will and Inheritance: Will- Meaning, difference between will and gift, Will made in death bed or during illness; Muslim law of Inheritance- Shia and Sunni schools; Distribution of property under Indian Succession Act of 1925 (Of Christians, Parsis and Jews)- Domicile - Parsis Intestate succession and Non Parsis Intestate succession, Succession certificate, Probate and letters of administration, powers and duties of executor.

UNIT-V: Wills – Privileged and unprivileged wills - Construction of Wills in brief - Void bequests, void wills, kinds of legacies - Protection of property of the deceased; Family Courts Act, 1984- Constitution, powers, and its functions; Need for Uniform Civil Code- Article 44 of Indian Constitution.

ENVIRONMENTAL LAW

UNIT – I: The Idea of Environment: Ancient and Medieval Writings, Traditions, Natural and Biological Sciences – Perspectives: Modern concept, Conflicting dimensions, recent issues - Environment and sustainable development - National and International Perspectives - Population and Development.

UNIT– II: Environmental Policy and Law: Environmental Policy : Pre & Post Independence Period; From Stockholm to Johannesburg Declaration (Rio) and Role of Government - Five year Plans - Forest Policy - Conservation strategy - Water Policy; Conservation of Natural Resources

and its Management; Constitution and Environment: Right to Environment - Constitutional provisions on Environment and its Protection - Role of Judiciary on Environmental issues - Evolving of new Principles - Polluter pays principle - Precautionary principle - Public trust doctrine.

UNIT - III: International Law and Environmental Protection: International conventions in the development of Environmental Laws and its Policy - From Stockholm to recent conventions (Special Emphasis on Major conventions & Protocols) - Control on Marine Pollution; Common Law aspects of Environmental Protection; Remedies under other Laws (I.P.C., Cr.P.C, C.P.C.) - Riparian rights and prior-appropriation.

UNIT – IV: Prevention and Control of Pollution: Pollution of Water, Sources, Legal Control, The Water Act, 1974 - Pollution of Air, Modalities of control, The Air Act, 1981 - Noise Pollution and its control, Noise Pollution control order - Disposal of Waste, laws on waste, disposal and its control - Trans-boundary Pollution hazards & Regulation; Biological Diversity and Legal Order: Bio-diversity and Legal regulation - Utilization of flora and fauna - Experimentation on animals - Legal and Ethical issues - Genetic Engineering - Wildlife Protection Act, 1972 - Forest Conservation Act, 1980 - Prevention of Cruelty against animals - Problems in Legal regulation of medicinal plants - The plant varieties Act - Wetland Conservation.

UNIT - V: Environment Protection Act, 1986 including, Environment Protection Rules, Coastal Zone Regulation, ECO-Mark, Environment Impact Assessment, Environmental Audit, Public Participation in Environmental decision making, Environment information, public hearing, Regulation on Bio-Medical Waste.

LABOUR LAW

UNIT- I: Introduction to Law of Industrial Disputes Act, 1947: Historical Aspects-Master and slave relationship-Industrial revolution-Laissez-faire state-Impact of Constitution on Labour provision; Definition and law relating to Appropriate Government- Award and settlement-Industry-Industrial Dispute- Workman. Strikes and Lock-out.

UNIT –II: Industrial Disputes Act, 1947: Lay-off –Retrenchment- Closure - Unfair Labour Practices and Role of Government; Authorities under the Act (Chapter II) to be read with chapters II B, III and IV Adjudication and Arbitration; Restrictions on the right of the employer-Chapter IIA-Notice of change, section 11-A and sections 33,33A; Recovery of money due from an employer. Industrial Employment (Standing Orders) Act, 1946 and Disciplinary Enquiry.

UNIT-III: Trade Unions Act, 1926: Salient features of the enactment and important definitions - Registration of Unions, Amalgamation of Unions, Cancellation and Registration of Trade Unions, Funds of the Union, Immunity enjoyed by the Union. Workmen's Compensation Act, 1923: Emergence of the legislation-Total and partial disablement –Dependent-Workman-Wages-Liability of the employer to pay compensation and right of the workman to receive compensation-Accident "Arising out of and in the course of employment"-Occupational disease-Doctrine of 'Added peril'.

UNIT –IV: Labour Welfare Legislations: The Employees State Insurance Act, 1948: Corporation, Standing Committee and Medical Benefit Council; Contributions; Benefits; Adjudication of disputes and Claims; Penalties. The Employees Provident Fund Act, 1952: Employees Provident Fund Scheme and Authorities; Miscellaneous. The Maternity Benefit Act, 1961- its object and its scope.

UNIT-V: The Minimum Wages Act, 1948- Fixation of minimum rates of wages - working hours and determination of wages and claims The Factories Act- its essential features, Safety, Health and Welfare measures. The Contract Labour (Regulation and Abolition) Act, 1970 - its object and its essential features.

CRIMINAL LAW –II: CRIMINAL PROCEDURE CODE, 1973, JUVENILE JUSTICE (CARE AND PROTECTION OF CHILDREN) ACT, 2000 AND PROBATION OF OFFENDERS ACT, 1958.

UNIT – I: Introductory and Pre-trial Process Meaning of procedure; The organization of the functionaries under the Code; their duties, functions and powers; First Information Report, complaint; Arrest; Types of trial and Features of a fair trial.

UNIT - II: Trial Process-I: 1. Magisterial Powers to take cognizance. 2. Commencement of proceedings. 3. Dismissal of complaints. 4. Charge. 5. Processes to compel appearance and production of things. 6. Bail. 7. Preliminary pleas to bar trial.

UNIT - III: Trail Process-II 1.Provisions as to Inquiries and Trials. 2. Judgment. 3. Appeals, Revision and Reference. 4. Security for keeping peace and good behaviour. 5. Maintenance.

UNIT - IV: Miscellaneous 1. Transfer of cases. 2. Execution, suspension, remission and commutation of sentences. 3. Disposal of property. 4. Preventive action of the police. 5. Irregular proceedings. 6. Limitation of taking cognizance. 7. Compounding of offences and plea bargaining. 8. Criminal Rules and Practice.

UNIT - V: 1. Salient features of the Juvenile Justice (Care & Protection of Children) Act, 2000. 2. Salient features of the Probation of Offenders Act, 1958.

JURISPRUDENCE

UNIT – I: Meaning and nature of 'Jurisprudence' - Purpose and value of Jurisprudence -Schools of Jurisprudence: Natural law, Imperative Theory, Legal Realism, Historical School, Sociological School.

UNIT – II: Functions and purpose of law, questions of law, fact and discretion - Justice and its kinds - Civil and Criminal Administration of Justice - Theories of Punishment and Secondary functions of the Court.

UNIT – III: Sources of Law: Legislation, Precedent and Custom - A Comparative study.

UNIT – IV: Legal Concepts: Right and Duty, Kinds, Meaning of Right in its wider sense; Possession: Idea of Ownership, kinds of Ownership, Difference between Possession and

Ownership; Nature of Personality, Status of the Unborn, Minor, Lunatic, Drunken and Dead Persons.

UNIT – V: Liability: Conditions for imposing liability - Wrongful act: Damnum Sine Injuria, causation, mens rea, intention, malice, negligence and recklessness, strict liability, vicarious liability, obligation.

CLINICAL COURSE-I: PROFESSIONAL ETHICS AND PROFESSIONAL ACCOUNTING SYSTEM

UNIT-I: The legal profession and its responsibilities; The equipment of the lawyer; Conduct in court; Professional conduct in general; Privileges of a lawyer; Salient features of the Advocates Act, 1961.

UNIT-II: Duty to the court; Duty to the profession; Duty to the opponent; Duty to the client; Duty to the self; Duty to the public and the state.

UNIT-III: Contempt of Court Act, 1972
Selected major judgments of the Supreme Court:
1. In the matter of D, An Advocate, AIR 1956 SC 102.
2. P.J.Ratnam v. D.Kanikaram, AIR1964 SC 244.
3. N.B.Mirzan v. The disciplinary committee of Bar Council of Maharastra and Another, AIR 1972 SC 46.
4. Bar Council Of Maharastra v. M.V.Dabholkar, etc., AIR 1976 SC 242.
5. V.C.Rangadurai v. D.Goplan and others, AIR 1979 SC 201.
6. Chandra Shekhar Soni v. Bar Council of Rajasthan and Others, AIR 1983 SC 1012.
7. In Re an Advocate, AIR 1989 SC 245.
8. In Re Vinay Chandra Mishra, 1995 (Vol-I) IBR 118.
9. Supreme Court Bar Association v. Union of India, AIR 1998 SC 1895.
10. Ex-Capt. Harish Uppal v. Union of India, AIR 2003 SC 739.

UNIT-IV: Selected opinions of the Bar council of India

1.	DC Appeal No. 16/93	1998	(Vol.1)	IBR 135
2.	BCI Tr. Case No.40/91	1998	(Vol.1)	IBR139
3.	DC Appeal No. 8/94	1998	(Vol. 1)	IBR 153
4.	DC Appeal No. 20/94	1997	(Vol. 3 &4)	IBR 193
5	BCI Tr. Case No. 76/95	1997	(Vol. 3 &4)	IBR 201
6	DC Appeal No.43/96	1997	(Vol. 3 &4)	IBR 207
7	DC Appeal No.18/91	1997	(Vol. 1 & 2)	IBR 271
8	DC Appeal No.24/90	1996	(Vol.1)	IBR 135
9	DC Appeal No.19/93	1996	(Vol.1)	IBR 152
10	BCI Tr. Case No.104/90	1996	(Vol.1)	IBR 155
11	BCI Tr. Case No.52/89	1994	(Vol.1)	IBR 187
12	BCI Tr. Case No.127/88	1992	(Vol. 3 &4)	IBR 125
13	BCI Tr. Case No.39/87	1992	(Vol. 3 &4)	IBR 147
14	BCI Tr. Case No.39/89	1992	(Vol. 3 &4)	IBR 149
15	BCI Tr. Case No.16/88	1989	(Vol.1)	IBR 99
16	BCI Tr. Case No.2/88	1989	(Vol.1)	IBR 102

17	BCI Tr. Case No.52/88	1989	(Vol.2)	IBR 110
18	DC Appeal No.41/87	1989	(Vol.2)	IBR 122
19	BCI Tr. Case No.29/81	1989	(Vol.2)	IBR 245
20	DC Appeal No.14/88	1989	(Vol.2)	IBR 258
21	BCI Tr. Case No.14/80	1989	(Vol.2)	IBR 264
22	DC Appeal No.24/87	1989	(Vol.2)	IBR 273
23	DC Appeal No.46/86	1989	(Vol.2)	IBR 280
24	DC Appeal No.3/88	1989	(Vol.2)	IBR 285
25	BCI Tr. Case No.2/80	1989	(Vol.2)	IBR 289
26	BCI Tr. Case No.10/86	1989	(Vol. 3 &4)	IBR 520
27	BCI Tr. Case No.101/88	1989	(Vol. 3 &4)	IBR 524
28	DC Appeal No.23/88	1989	(Vol. 3 &4)	IBR 532
29	DC Appeal No.35/87	1989	(Vol. 3 &4)	IBR 536
30	BCI Tr. Case No.27/88	1989	(Vol. 3 &4)	IBR 542
31	BCI Tr. Case No.6/84	1989	(Vol. 3 &4)	IBR 560
32	BCI Tr. Case No.24/86	1989	(Vol. 3 &4)	IBR 563
33	DC Appeal No.10/88	1989	(Vol. 3 &4)	IBR 572
34	DC Appeal No.45/74	1988	(Vol. 1 &2)	IBR 182
35	DC Appeal No.23/87	1989	(Vol.1& 2)	IBR 187
36	DC Appeal No.6/81	1988	(Vol.1& 2)	IBR 193
37	BCI Tr. Case No.16/86	1988	(Vol.1& 2)	IBR 197
38	DC Appeal No.41/86	1988	(Vol.1& 2)	IBR 200
39	DC Appeal No.33/86	1988	(Vol. 3 &4)	IBR 354
40	DC Appeal No.21/85	1988	(Vol. 3 &4)	IBR 359
41	BCI Tr. Case No.43/82	1988	(Vol. 3 &4)	IBR 364
42	DC Appeal No.28/86	1988	(Vol.3& 4)	IBR 374
43	DC Appeal No.64/74	1987	(Vol.2)	IBR 314
44	DC Appeal No.30/84	1987	(Vol.2)	IBR 319
45	DC Appeal No.40/86	1987	(Vol.3)	IBR 488
46	DC Appeal No.10/86 &10A/86	1987	(Vol.3)	IBR 491
47	DC Appeal No.7/86	1987	(Vol.3)	IBR 496
48	DC Appeal No.7/81	1987	(Vol.4)	IBR 735
49	DC Appeal No.12/86	1987	(Vol.4)	IBR 745
50	BCI Tr. Case No.57/87	1987	(Vol.4)	IBR 753

PUBLIC INTERNATIONAL LAW

UNIT-I: Nature, definition, origin and basis of International Law; Sources of International Law; Relationship between Municipal and International Law; Subjects of International Law.

UNIT- II: States as subjects of International Law: States in general; Recognition; State territorial sovereignty.

UNIT –III: State Jurisdiction: Law of the sea; State Responsibility; Succession to rights and obligations.

UNIT – IV: State and Individual - Extradition, Asylum and Nationality; the agents of international business; diplomatic envoys, consuls and other representatives; the law and practice as to treaties.

UNIT – V: The United Nations Organisation - Principal organs and their functions; World Trade Organisation- Main features; International Labour Organisation.

HUMAN RIGHTS LAW AND PRACTICE

UNIT – I: Jurisprudence of Human Rights; Nature, definition, origin and theories of human rights.

UNIT – II: Universal protection of human rights- United Nations and Human Rights- Universal Declaration of Human Rights, 1948; International Covenant on Civil and Political Rights, 1966; International Covenant Economic, Social and Cultural Rights, 1966.

UNIT - III: Regional Protection of Human rights- European system- Inter American System- African System.

UNIT – IV: Protection of Human Rights at national level; Human rights and the Constitution; The Protection of Human rights Act, 1993.

UNIT - V: Human Rights and Vulnerable Groups: Rights of Women, Children, Disabled, Tribals, Aged and Minorities - National and International Legal Developments.

RIGHT TO INFORMATION

UNIT-I: Right to Information before Right to Information Act, 2005; Significance in democracy; Constitutional basis; Supreme Court on right to information.

UNIT-II: RTI Act- definitions; Right to information and obligations of public authorities.

UNIT-III: Central information commission; State information commission; Powers and functions of information commissions; Appeals and penalties.

UNIT-IV: Other related laws - The Official Secrets Act, 1923; The Public Records Act, 1993; The Public Records Rules, 1997; The Freedom of Information Act, 2002; The Commission of Inquiry Act, 1952; The Commission of Inquiry (Central) Rules, 1972.

UNIT-V: Best practices- A study of decisions rendered by state commissions and central Commission in the following areas of – Police, Revenue, PWD, Irrigation, Secretariat, BSNL, Posts and Telegraphs, Scheduled Banks, CPWD, Income Tax Department, Central Excise Department, Local Authorities.

BANKING LAW

UNIT – I: Indian Banking Structure - Origin – Evolution of Banking Institutions – Types and functions of banks - Commercial banks – Functions – Banking Companies in India – RBI - Constitution, Management and Functions - Banking Regulation Act, 1949 – State Bank of India- UTI, IDBI, RRBs'-Local banks.

UNIT - II: Employment of funds - Loans and Advances- Guarantees- Advances secured by Collateral securities-Agency Services- Financing of Exports- Special Banking Services – Advances to Priority Sectors and Credit Guarantee schemes- Securitisation Act, 2002.

UNIT - III: Law relating to Negotiable Instruments, 1881 Act (Read with the amended Act of 2002) - Negotiable Instruments - Kinds - Holder and holder in due course – Parties – Negotiation- Assignment – Presentment – Endorsement – Liability of parties – Payment in due course – Special rules of evidence - Material alteration – Noting and protest – Paying banker and collecting banker – Bills in sets – Penal provisions under NI Act - Banker's book evidence Act.

UNIT – IV: Banker and customer Relationship - Definition of banker and customer – General relationship – Special relationship - Banker's duty of secrecy, banker's duty to honour cheques, banker's lien, and banker's right to set off - Appropriation of payments - Garnishee order - Customer's duties towards his banker. Opening of New Accounts – Special types of customers - Minor's A/C, Joint A/C, Partnership A/C, Company's A/C, Married women's A/C, Trust A/C, Joint Hindu family A/C - Illiterate persons, lunatics, executors - Precautions required in case of administrators, clubs, societies and charitable institutions to open an account.

UNIT – V: Ancillary Services and E- Banking: Remittances - General, DD, MT, TT, Traveler's cheques, bank orders, credit card, debit/smart cards, safe deposit vaults, gift cheques, stock invest. E-Banking - Definition – E-Banking includes - Internet banking, mobile banking, ATM banking, computerized banking –E- banking services – retail services – wholesale services – E-Chequeauthentication- Cyber Evidence-Banking Ombudsman.

INSURANCE LAW

UNIT – I: Introduction: Nature- Definition- History of Insurance- History and development of Insurance in India- Insurance Act, 1938- (main sections) Insurance Regulatory Authority Act, 1999: Its role and functions.

UNIT – II: Contract of Insurance: Classification of contract of Insurance- Nature of various Insurance Contracts- Parties there to- Principles of good faith – non disclosure – Misrepresentation in Insurance Contract- Insurable Interest- Premium: Definitionmethod of payment, days of grace, forfeiture, return of premium, Mortality; The risk – Meaning and scope of risk, Causa Proxima, Assignment of the subject matter.

UNIT – III: Life Insurance: Nature and scope of Life Insurance- Kinds of Life Insurance. The policy and formation of a life insurance contract- Event insured against Life Insurance contract- Circumstance affecting the risk- Amount recoverable under the Life Policy- Persons entitles to Payment - Settlement of claim and payment of money- Life Insurance Act, 1956- Insurance against third party rights- General Insurance Act, 1972- The Motor Vehicles Act, 1988 – Sec.

(140-176), Nature and scope- Absolute or no fault liabilities, Third party or compulsory insurance of motors vehicles- Claims Tribunal Public Liability Insurance –Legal aspects of Motor Insurance –Claims – Own Damages Claims – Third Party Liability Claims.

UNIT – IV: Fire Insurance: Nature and scope of Fire Insurance –Basic Principles – Conditions & Warranties – Right & Duties of Parties – Claims – Some Legal Aspects. Introduction to Agriculture Insurance – History of Crop Insurance in India – Crop Insurance Underwriting, Claims, Problems associated with Crop Insurance – Cattle Insurance in India.

UNIT – V: Marine Insurance: Nature and Scope- Classification of Marine policies- Insurable interest- Insurable values- Marine insurance and policy- Conditions and express warranties- Voyage deviation- Perils of sea- Loss- Kinds of Loss- The Marine Insurance Act, 1963 (Sections 1 to 91).

ALTERNATIVE DISPUTE RESOLUTION SYSTEMS

UNIT-I: General; Different methods of dispute resolution; Inquisitorial method; Adversarial method; Other methods- both formal and informal- like Arbitration, Conciliation, Negotiation, Mediation, etc.; Advantages and disadvantages of above methods; Need for ADRs; International commitments; Domestic needs; Suitability of ADRs to particular types of disputes; Civil Procedure Code and ADRs.

UNIT-II: Arbitration: Meaning of arbitration; Attributes of arbitration; General principles of arbitration; Different kinds of arbitration; Qualities and qualifications of an arbitrator; Arbitration agreement and its drafting; Appointment of arbitrator; Principal steps in arbitration; Arbitral award; Arbitration under Arbitration and Conciliation Act, 1996.

UNIT-III: Conciliation: Meaning; Different kinds of conciliation- facilitative, evaluative, courtannexed, voluntary and compulsory; Qualities of a conciliator; Duties of a conciliator;
Role of a conciliator; Stages of conciliation; Procedure; Conciliation under statutes Industrial Disputes Act, 1947; Family Courts Act, 1984; Hindu Marriage Act, 1955; Arbitration and Conciliation Act, 1996.

UNIT-IV: Negotiation: Meaning; Different styles of negotiation; Different approaches to negotiation; Phases of negotiation; Qualities of a negotiator; Power to negotiate.

UNIT-V: Mediation: Meaning; Qualities of mediator; Role of mediator; Essential characteristics of the mediation process – voluntary, collaborative, controlled, confidential, informal, impartial & neutral, self-responsible; Different models of mediation; Code of conduct for mediators.

CIVIL PROCEDURE CODE AND LIMITATION ACT

UNIT – I: Civil Procedure Code Introduction; Distinction between procedural law and substantive law- History of the code, extent and its application, definition; Suits: Jurisdiction of the civil courts- Kinds of jurisdiction-Bar on suits- Suits of civil nature (Sec.9); Doctrine of Res sub judice and Res judicata (Sec. 10, 11 and 12); Foreign Judgment (Sec. 13, 14); Place of Suits (Ss. 15 to 20); Transfer of Cases (Ss. 22 to 25).

UNIT – II: Institution of suits and summons: (Sec. 26, 0.4 and Sec. 27, 28, 31 and O.5); Interest and Costs (Sec. 34, 35, 35A, B); Pleading: Fundamental rules of pleadings- Plaint and Written Statement- Return and rejection of plaint- Defences- Set off- Counter claim; Parties to the suit (O. 1): Joinder, misjoinder and non-joinder of parties- Misjoinder of causes of action- Multifariousness.

UNIT – III: Appearance and examination of parties (O.9, O.18) - Discovery, inspection and production of documents (O.11 & O.13) - First hearing and framing of issues (O.10 and O.14) - Admission and affidavit (O.12 and O.19) - Adjournment (O.17) - Death, marriage-Insolvency of the parties (O.22) - Withdrawal and compromise of suits (O.23) - Judgment and Decree (O.20); Execution (Sec. 30 to 74, O.21): General principal of execution- Power of executing court- Transfer of decrees for execution- Mode of execution- a) Arrest and detention, b) Attachment, c) Sale.

UNIT – IV: Suits in particular cases; Suits by or against Governments (Sec. 79 to 82, O.27); Suits by aliens and by or against foreign rulers, ambassadors (Sec. 85 to 87); Suits relating to public matters (Sec. 91 to 93); Suits by or against firms (O.30); Suits by or against minors and unsound persons (O.32); Suits by indigent persons (O.33); Inter-pleader suits (Sec. 88, O.35); Interim Orders; Commissions (Sec. 75, O.26); Arrest before judgment and attachments before judgment (O.38); Temporary injunctions (O.39); Appointment of receivers (O.40); Appeals (Ss. 90 to 109, O.41, 42, 43, 45); Reference- Review and Revision (Ss. 113, 114, 115, O.46, O.46); Caveat (Sec. 144.A)- Inherent powers of the court (Ss. 148, 149, 151).

UNIT –V: Limitation Act.

INTELLECTUAL PROPERTY RIGHTS-I

UNIT – I: Introductory Aspects: Overview of the concept of property; Industrial property and non-industrial property; Historical background of IPR; Importance of human creativity in present scenario; Different forms of IP and its conceptual analysis. Patents: Introduction and overview of patent protection; History of Patent protections; What is patent and definition of patent; Object of patent; Scope and salient features of patent; How to obtain patent; Product patent and Process patent; Specification – Provisional and complete specification; Procedure for patent applications; Register of patents and Patent Office; Rights and obligations of patentee; Transfer of Patent Rights; Government use of inventions; Biotech patents and patentability of life forms; Infringement of Patents; Offences and Penalties.

UNIT – II: Trade Marks: Introduction and overview of trade mark; Evolution of trade mark law; Object of trade mark; Features of good trade mark; Different forms of trade mark; Trade mark registry and register of trademarks; Property in a trade mark; Registrable and nonregistrable marks; Basic principles of registration of trade mark; Deceptive similarity; Assignment and transmission; Rectification of register; Infringement of trade mark; Passing off; Domain name protection and registration; Offences and penalties.

UNIT-III: Introduction and overview of Cyber Intellectual Property; Intellectual property and cyberspace; Emergence of cyber-crime; Grant in software patent and Copyright in software;

Software piracy; Trademarks issues related to Internet (Domain name); Data protection in cyberspace; E-commerce and Econtract; Salient features of Information Technology Act; IPR provisions in IT Act; Internet policy of Government of India.

UNIT-IV: Geographical Indications: Introduction and overview of geographical indications; Meaning and scope of geographical indications; Important geographical indications of India and their features; Salient features of the Protection of Geographical Indications Act; Protection of geographical indications; Misleading use of geographical indications; Registration of geographical indications; Right to use geographical indications; Infringement; Remedies against infringement; Role and functions of Registrar of Geographical indication; Conflict between Trade mark and geographical indications.

UNIT-V: International Convention and Treaties: Paris Convention: Background; Salient features of Paris Convention; Governing rules of Paris Convention; Patent Cooperation Treaty: Background; Objectives of PCT; Salient features of PCT; Madrid Convention: Salient features; International registration of marks; World Intellectual Property Organization: Background; Salient features WIPO; Organization of WIPO.

INTELLECTUAL PROPERTY RIGHTS-II

UNIT-I: Indian Copyright Law: Introduction and overview of copyright: History of the concept of copyright and related rights; Nature of copyright: Salient features of Copyright Act; Subject matter of copyright; Literary work; Dramatic work; Musical works; Artistic works; Cinematographic films; Sound recordings; Term of copyright; Computer software and copyright protection; Author and ownership of copyright; Rights conferred by copyright; Assignment, transmission and relinquishment of copyright; Infringement of copyright; Remedies against infringement of copyright.

UNIT-II: Biological Diversity Law: Introduction and overview of Biological Diversity; Meaning and scope of Biological Diversity; Biological resources and traditional knowledge; Salient features of Biological Diversity Act; Biological Diversity concerns and issues; Bio piracy; Regulation of access to Biological Diversity; National Biodiversity Authority; Functions and powers of Biodiversity Authority; State Biodiversity Board; Biodiversity Management Committee and its functions.

UNIT-III: Protection of Plant Varieties and Farmers Rights Law: Legal concepts relating to the protection of plant varieties rights; Legal concepts relating to the protection of plant breeders rights; IPR in new plant varieties; Policy and objectives of protection of plant varieties and farmers rights act; Plant varieties and Farmers rights protection authority; National register of plant varieties; Procedure for registration; Rights and privileges; Benefit sharing; Compensation to communities; Compulsory licence; Relief against infringement; National Gene Fund.

UNIT-IV: Designs Law: Introduction and overview of Designs Law; Salient features of Designs Law; Procedure for registration; Rights conferred by registration; Copyright in registered designs; Infringement ; Powers and duties and Controller; Distinction between design, trade mark, copyright & patent.

UNIT-V: International Treaties / Conventions on IPR: TRIPS Agreement: Background; Salient Features of TRIPS; TRIPS and Indian IPR; Berne Convention: Background; Salient features of Paris Convention; Convention of Bio-Diversity: Objectives of CBD; Salient features of CBD; International IPR agreements affecting protection of plant varieties: The WTO Doha round of trade negotiations; International Treaty on Plant Genetic Resources ("ITPGR").

PENOLOGY & VICTIMOLOGY

UNIT – I: Introduction: Notion of punishment in law; Difference between crime prevention and control; Theories of punishments.

UNIT - II: Kinds of punishment; Sentencing policies and processes; the riddle of capital punishment.

UNIT - III: Prison reforms; Alternatives to imprisonment; Victimology- Introduction, history and philosophy.

UNIT – IV: Victimology- European experience; American experience; Victim witness assistance programmes; Restitution.

UNIT – V: Victimology - Indian experience; Legal framework; Role of Courts; Role of NHRC.

INTERPRETATION OF STATUTES & PRINCIPLES OF LEGISLATION

UNIT-I: Basic Principles; Guiding rules; internal aids to construction.

UNIT-II: External aids to construction.

UNIT-III: Subsidiary rules; Operation of statutes; Expiry and repeal of statutes.

UNIT-IV: Statutes affecting the state; Statutes affecting the jurisdiction of courts. Construction of taxing statutes and evasion of statutes; Remedial and penal statutes.

UNIT-V: Principles of Legislation.

COMPETITION LAW

UNIT-I: Constitutional provisions regulating trade; Salient features of MRTP Act, 1986; Salient features of Consumer Protection Act, 1986.

UNIT-II: Sherman Antitrust Act, 1890; Relevant provisions of Clayton Act, 1914; Relevant provisions of the Federal Trade Commission Act; Salient features of U.K. Competition Act, 1998.

UNIT-III: The Competition Act, 2002; Preliminary; Prohibition of certain agreements, abuse of dominant position and regulation of combinations. UNIT-III Competition Commission of India; Duties, powers and functions.

UNIT-III: Duties of Director general; Penalties; Competition advocacy; important judgments of the Supreme Court.

LAW OF EVIDENCE

UNIT-I: Introduction: Distinction between substantive and procedural law- Conceptions of evidence in classical Hindu and Islamic Jurisprudence- Evidence in customary law systems (Non-state law)-Introduction to the British 'Principles of Evidence'- Legislations dealing with evidence (other than Indian Evidence Act) with special reference to CPC, Cr.P.C., Bankers Book Evidence Act, Commercial Document Evidence Act, Fiscal and revenue Laws- Salient features of the Indian Evidence Act, 1861, Applicability of the Indian Evidence Act. Central Conceptions in Law of Evidence – Facts - Facts in issue and relevant facts- Evidence- Circumstantial and direct evidencePresumptions, proved, disproved, not proved- Witness- Appreciation of evidence. Relevancy of Facts- Facts connected with facts in issue-Doctrine of Res gestae; Sections 6, 7, 8 and 9 of Evidence Act- Evidence of Common Intention-Section10, Relevancy or otherwise irrelevant facts- Facts to prove right or custom (Section13)-Facts concerning state of mind/state of body or bodily feelings (Sections 14 and 15) - Relevancy and admissibility of admissions, privileged admissions- evidentiary value of admissions (Sections 17 to 23).

UNIT-II: Relevancy and admissibility of confessions- Admissibility of information received from an accused person in custody- Confession of co-accused (Sections 24 to 30) - Admitted facts need not be proved (Section 58); Dying declaration- Justification for relevanceJudicial standards for appreciation of evidentiary value-Section 32 (1) with reference to English Law - Other statements by persons who cannot be called as witnesses- (Sections 32(2) to (8), 33)- Statement under special, circumstances (Sections 34 to 39); Relevance of judgments- General principles – Fraud and collusion (Sections 40 to Sec. 44); Expert testimony: General principles (Sections 45-50) - Who is an expert- Types of expert evidence – Problems of judicial defence to expert testimony.

UNIT-III: Character evidence- Meaning – Evidence in Civil Criminal cases; English Law (Sections 52-55)- Oral and documentary Evidence -Introduction on Proof of facts General principles concerning oral; Evidence (Sections 59-60)- General principles concerning documentary; Evidence (Sections 61-90)- General principles regarding exclusion by evidence (Sections 91-100).

UNIT-IV: Burden of Proof- The general conception of onus probandi (Section 101)- General and special exception to onus probandi (Sections102-106)- The justification of presumption and burden of proof (Sections 107 to 114) with special reference to presumption to legitimacy of child and presumption as to dowry death-Doctrine of judicial notice and presumptions. Estoppel: Scope of Estoppel - Introduction as to its rationale (Section 115)- Estoppel distinguished from Res judicata - Waiver and Presumption- Kinds of Estoppel- Equitable and Promissory Estoppel- Tenancy Estoppel (Section 116).

UNIT-V Witness, Examination and Cross Examination: Competence to testify (Sections 118 to 120)-Privileged communications (Sections 121 to 128)- General principles of examination and cross examination (Sections 135 to 166)- Leading questions (Sections 141- 145)- Approver's

testimony (Section 133)- Hostile witnesses (Section 154)- Compulsion to answer questions (Sections 147, 153)- Questions of corroboration(Sections 156-157)- Improper admission of evidence.

TAXATION

UNIT – I: Concept of Tax- Nature and characteristics of taxes- Distinction between tax and fee, tax and cess- Direct and Indirect taxes- Tax evasion and tax avoidance- Scope of taxing powers of Parliament, State Legislatures and Local bodies. The Income Tax Act: Basis of taxation of Income- Incomes exempted from tax- Income from salaries- Income from house property- Income from business or profession and vocation- Income from other sources- Taxation of individuals, HUF, firms, association of persons, Cooperative Societies and Non- Residents.

UNIT- II: Income Tax Authorities- Their appointment- Jurisdiction- Powers and functions Provisions relating to collection and recovery of tax- Refund of tax, appeal and revision provisions, offences and penalties. Wealth Tax: Charge of Wealth tax, assets, deemed assets, and assets exempted from taxWealth tax Authorities- Offences and penalties.

UNIT- III: Central Excise Laws: Nature, scope and basis of levy of Central Excise duty- Meaning of goods- Manufacture and manufacturer- Classification and valuation of goods- Duty payment and exemption provisions- Provisions and procedure dealing with registration and clearance of goods- An overview of set-off of duty scheme.

UNIT- IV: Customs Laws: Legislative background of the levy- Appointment of Customs officers Ports- warehouses- Nature and restrictions on exports and imports- Levy, exemption and collection of customs duties, and overview of law and procedure - Clearance of goods from the port, including baggage- Goods imported or exported by post, and stores and goods in transit- Duty drawback provisions.

UNIT-V: Central Sales Tax Laws: Evolution and scope of levy of Central Sales tax- Inter- State sale outside a State and sale in the course of import and export- Basic principles Registration of dealers and determination of taxable turnover; Service Tax – Main features of Service Tax; VAT- Introduction to Value Added Tax.

WOMEN AND CRIMINAL LAW & LAW RELATING TO CHILD

UNIT-I: Women in Pre-Constitution Period: Social and Legal Inequality; Social Reform Movement in India; Legislative response in India. Women & children in Post-Constitution Period. Provisions of Constitution of India Preamble, Art.14, 15, 23, and Part IV Legal Measures in relating to Child Labour Women and Political Representation.

UNIT-II: Different Personal Laws- Unequal Position of Indian Women-Uniform Civil Code; Sex Inequality in Inheritance Rights: Right of Inheritance by birth for Sons and not for Daughters; Inheritance under Christian Law; Inheritance under Muslim Law; Matrimonial Property Law; Right of Women to be Guardian of her minor sons and daughters.

UNIT-III: Law of Divorce - Christian Law-Discriminatory Provision; Muslim Law- Inheritance divorce. Women and Social Legislation: Dowry Prohibition Law; Sex Determination Test, Law relating to Prevention of Immoral Trafficking in Women Act.

UNIT-IV: Women and Criminal Law: Adultery; Rape; Outraging the Modesty of Women; Kidnapping; Sati Prohibition Law; Law relating to Domestic Violence; Law relating Eve Teasing; Indecent Representation of Women Act.

UNIT-V: Women and Employment: Factories Act- Provisions relating to women; Maternity Benefit Act; Equal Remuneration Act; Law Relating to Sexual Harassment at Working Place; N.C.W-Aims, Functions and Performance.

LAW RELATING TO INTERNATIONAL TRADE

UNIT-I: Historical perspectives of International Trade, Institutions – UNCTAD, UNCITRAL, GATT (1947-1994); World Trade Organization-Objectives, Structure, Power; Most Favored Nation Treatment and National Treatment; Tariffs and Safeguard measures.

UNIT-II: Technical Barriers to Trade; Sanitary and Phyto- sanitary measures; Trade Related Investment Measures (TRIMs); Anti- Dumping, Subsidies and Countervailing Measures; Dispute Settlement Process.

UNIT-III: International Sales of Goods Formation and Performance of International Contracts, Various Forms and Standardization of Terms; Acceptance and Rejection of Goods, Frustration of Contract, Invoices and packing, Product liability.

UNIT-IV: Exports – Insurance of Goods in Transit; Marine Insurance and kinds; Law on Carriage of goods by sea, land and air, Container transport, Pre-Shipment Inspection; Licensing of Export and Imports.

UNIT-V: Laws Governing Finance and Investments; Foreign Collaboration and Investment Policy; Foreign Direct Investment in Industries and Governing Policies; Foreign Institutional Investors (FIIs): Investment by Non-resident Indians (NRIs) and Overseas Corporate Bodies (OCBs); Foreign Collaboration Agreement- Foreign Technology Agreement; Foreign Companies and Foreign Nationals in India.

PGQP03

Entrance Test for the Course(s): M.A. (Education) [CUPUN], [CURAJ].

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

I. **Education & Philosophy**: Nature & Meaning of Education, Relationship between Philosophy & Education

II. **Major Philosophies of Education**: Naturalism; Idealism; Pragmatism

III. **Educational Thinkers & their Contribution in developing Principles of Education**: M. K. Gandhi: Basic Education; Tagore, John Dewey: Learning by doing,

IV. **Culture & Social Change**: Concept & Dimensions of Culture; Relationship between Culture & Education with special reference to conservative and creativity roles; Concept of social change and Roles of Education for social change.

V. **Psychology & Educational Psychology**: Nature & Meaning of Psychology; Nature, Meaning and functions of Educational Psychology.

VI. **Learning & Motivation**: Concept of learning & Motivation; Factors of influencing learning – Personal & Environmental, Techniques of enhancing learner's motivation; S-R Theory of Learning (Thorndike), Classical conditioning (Pavlov), Operant Conditioning theory of learning (Skinner) and Gestalt theory of Learning (Kohler et al), Cognitive theory (Piaget), Social development theory (Vygotsky), Behaviourism, Constructivism and Eclectic approach.

VII. **Growth and Development**: Concept, Stages of development, Role of hereditary and environment in the development of individual

VIII. **Intelligence**: Nature & Meaning, Measurement of Intelligence – Concept of I.Q, Verbal, Nonverbal & Performance tests; Two-factor Theory (Spearman); Multifactor Theory (Thurston); Structure of intellect (Guilford), Multiple Intelligence (Gardner)

IX. **Personality**: Meaning & nature and Development of Personality – biological & socio-culture determinant a brief overview of Trait-theory of Personality (Allport), Factor-theory.

PGQP04

Entrance Test for the Course(s): M.Ed. (Master of Education) [CUGUJ], [CUHAR], [CUJAM], [CUKER], [CUPUN], [CUSBR].

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

Unit-I: Basics of Education: Meaning and nature of Education, Modes of Education-Formal, non-formal, open and MOOCS. Aims of Education. Philosophy and Education, Meaning and scope of philosophy. Functions of Philosophy, Relationship between education and philosophy. Significance of Philosophy of Education. Western schools of philosophy: Naturalism. Idealism, Pragmatism, Existentialism their educational implications for aims content, methods of teaching and role of a teacher and concept of discipline. , Educational Thinkers: M.K Gandhi Allama Iqbal, John Dewey, J.J Rousseau.

Unit- II: Indian Society and Education: Education as a sub-system of Indian Society. Education and relationship with Indian Social Structure., Social Demand for Education, School as a Social Unit: Democracy in School life; Culture and Education.

Unit-III: Psychology & Educational Psychology: Nature & Meaning of Psychology; Nature, Meaning and functions of Educational Psychology. Learning & Motivation: Concept of learning & Motivation; Factors of influencing learning – Personal & Environmental, Techniques of enhancing learner's motivation; S-R Theory of Learning (Thorndike), Classical conditioning (Pavlov), Operant Conditioning theory of learning (Skinner) and Gestalt theory of Learning (Kohler et al), Cognitive theory (Piaget), Social development theory (Vygotsky), Behaviorism, Constructivism and Eclectic approach.

Unit-IV: Intelligence and Personality : Nature & Meaning, Measurement of Intelligence – Concept of I.Q, Verbal, Non- verbal & Performance tests; Two-factor Theory (Spearman); Multifactor Theory (Thurston); Structure of intellect (Guilford), Multiple Intelligence (Gardner) Personality: Meaning & nature and Development of Personality – biological & socio-culture determinant a brief overview of Trait-theory of Personality (Allport), Factor-theory of Personality (Cattell), Psycho analytical theory of Personality (Freud), Maslow's hierarchy of needs and their Educational implication.

Unit-V: Definition, concept and importance of inclusive education. Historical perspectives on education of children with diverse needs. Difference between special education, integrated education and inclusive education. Advantages of inclusive education for all children.

Unit-VI: Concept &Functions of Educational Management; Basis of management Planning, Organizing, Control, Direction and Financing. School as a unit of decentralization planning. Modern Management Techniques: Case study, Man power surveys; Educational Management information system (EMIS).

Unit-VII: Nature, Scope &Types of Guidance. Meaning and Definitions of Counseling; Counseling as profession; Phases of Counseling Process: Assessment, Intervention, and Termination; Qualities of an Effective Counselor.

Unit-VIII: Elementary Education in India, Concept of Elementary Education, Objectives of Elementary Education (UEE), District Primary Education Programme (DPEP), Universalization of Elementary Education (UEE), Sarva Shiksha Abhiyan (SSA) 2002, Right to Education Act (RTE) 2009.

Unit-IX: Current issues: Universalization of Elementary Education with special reference to Sarva Siksha Abhyan; Education of children with special needs, Women's Education, Education of Weaker Sections.

Unit-X: Teaching Process: Concept of teaching; Characteristics & Functions of teaching; Principles & Maxims of teaching, Techniques of Teacher-Preparation: Microteaching - Nature & Meaning, Main proposition, Phases, Steps, Merits & Limitations; Simulated - Nature & Meaning, Teaching Role Play, Advantages & Limitations; Programmed learning- Meaning & Characteristics, Learning - Principles & Development of the Programmed instructions. - Types. - Merits & Demerits.

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PGQP05

Entrance Test for the Course(s): M.A. (English) [CUGUJ], [CUJAM], [CUJHD], [CUKNK], [CUPUN], [CURAJ], [CUSBR], [CUTND], (English Language & Literature) [CUAPH], (English and Foreign Language) [CUHAR], (English & Comparative Literature) [CUKER], (Linguistics and Language Technology) [CUKER], (Linguistics) [CUKNK]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

I. History of English and Indian Literatures: General trends

II. Literary Terms: Allegory, ballad, blank verse, comedy, connotation and denotation, dissociation of sensibility, dramatic monologue, elegy, enlightenment, epic, fancy and imagination, free verse, imitation, intentional fallacy, meter, motif, ode, onomatopoeia, paradox, plot, point of view, satire, soliloquy, sonnet, tragedy, wit etc.

III. Literary Genres: Fiction and non-fiction (traditional and modern classification); autobiography, biography, diary, drama, essay, novel, poetry, prose, short story etc.; types and sub-types.

IV. Comparative Literature: Definition, scope, aims and objectives; key terms, literary historiography, myth, motif etc.

V. Literary trends and literary movements: Aestheticism, modernism and post-modernism, mysticism, naturalism, progressivism, realism, revolutionary literature, romanticism.

VI. Elementary knowledge of famous authors and texts: From Indian, Western and Classical literature.

VII. Awareness of current literary trends, events, activities, awards etc.

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PGQP06

Entrance Test for the Course(s): M.A. (Hindi) [CUGUJ], [CUHAR], [CUJAM], [CUJHD], [CUKNK], [CUPUN], [CURAJ], [CUSBR], [CUTND], (Hindi & Comparative Literature) [CUKER], P.G. Diploma (Hindi (Hindi Translation and Office procedure)) [CUKER], (Hindi (Mass Communication and media writing)) [CUKER], PG Certificate/ Diploma (Hindi-English Translation and Vice-versa) [CUJAM]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

1. हिंदी साहित्य का काल विभाजन और नामकरण
2. हिंदी साहित्य का इतिास (आदिकाल से आधुतनक काल तक)

   प्रमुख रचनाकार, रचनाएँ और प्रवृतियाँ
3. हिंदी साहित्य की विविध विधाएँ एवं रचनाकार

   (उत्तन्यास, कहानी, नाटक, निबंध, आलोचना एवं अन्य गद्य विधाएँ)
4. प्रयोजन मूरक हिंदी के विविध रूप
5. जनसिंचार माध्यमों में हिंदी

   (समाचार पत्र और हिंदी, विज्ञात्तन और हिंदी, रेडियो एवं टेलीविजन में हिंदी)
6. भारतीय काव्य शास्त्र (शब्द शक्ति, काव्य हेतु, काव्य प्रयोजन एवं काव्य लक्षण)
7. हिंदी व्याकरण (संधि, समास, काल, वाक्य विन्यास)

PGQP07

Entrance Test for the Course(s): M.A. (Malayalam) [CUKER]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

കേരളത്തിലെ വിവിധ സർവകലാശാലകളിൽ നടപ്പിലാക്കിയിട്ടുള്ള ബി.എ/ബി.എസ്.സി കോമൺകോഴ്സ് സിലബസും ബി.എ. മലയാളം ഐശ്ചിക സിലബസും മാതൃകയാക്കിക്കൊ□ ുള്ള ചോദ്യാവലികളാണ് എം.എ.മലയാളം പ്രവേശനപരീക്ഷയ്ക്കായി തയ്യാറാക്കുക. മലയാള ഭാഷയെയും സാഹിത്യത്തെയും അനുബന്ധവിഷയങ്ങളെയും സംബന്ധിച്ചുള്ള വിദ്യാർത്ഥികളുടെ പൊതുധാരണ അടയാളപ്പെടുത്തുന്നതാണ് പരീക്ഷയുടെ രീതി.

മലയാളഭാഷ, വ്യാകരണം, ഭാഷാശാസ്ത്രം, കഥാസാഹിത്യം, കവിത, സാഹിത്യവിമർശനം, സാഹിത്യസിദ്ധാന്തങ്ങൾ, സാഹിത്യചരിത്രം, കേരളത്തിന്റെ സാംസ്കാരികചരിത്രം, നാടകം, ഇന്റർനെറ്റും സാഹിത്യവും തുടങ്ങിയ മേഖലകളെയെല്ലാം സ്പർശിച്ചുകൊ□ ുള്ളതായിരിക്കും ചോദ്യാവലികൾ.

മൊഡ്യൂൾ–1

ഭാഷ–നിർവ്വചനങ്ങൾ, വിവിധഗോത്രങ്ങൾ, സമുദ്ഭവസിദ്ധാന്തങ്ങൾ, പാട്ട് പ്രസ്ഥാനം, മണിപ്രവാളപ്രസ്ഥാനം, ശാസനങ്ങൾ, ഗാഥ, തുള്ളൽ, കിളിപ്പാട്ട്, വഞ്ചിപ്പാട്ട്, ആട്ടക്കഥ തുടങ്ങിയ പ്രസ്ഥാനങ്ങൾ–സാമാന്യപരിചയം.

മൊഡ്യൂൾ – 2

മലയാളകവിത–ആധുനികം–ആധുനികാനന്തരം: ആശാൻ, വള്ളത്തോൾ, ഉള്ളൂർ, ചങ്ങമ്പുഴ, ഇടശ്ശേരി, വൈലോപ്പിള്ളി, അക്കിത്തം, ഒ.എൻ.വി., സച്ചിദാനന്ദൻ, കെ.ജി.ശങ്കരപ്പിള്ള, ബാലചന്ദ്രൻ ചുള്ളിക്കാട്, വിജയലക്ഷ്മി, പി.പി.രാമചന്ദ്രൻ, എസ്.ജോസഫ് തുടങ്ങിയവരുടെ രചനാരീതി, ആവിഷ്കാരം, പുതുപ്രവണതകൾ.

മൊഡ്യൂൾ – 3

മലയാളചെറുകഥ–നോവൽ എന്നിവയുടെ ഉദ്ഭവം, വളർച്ച രൂപഭാവങ്ങൾ, ചരിത്രപരവും സാംസ്കാരികവുമായ പ്രത്യേകതകൾ ഇവയെക്കുറിച്ചുള്ള അന്വേഷണം–അപഗ്രഥനം

കേസരി വേങ്ങയിൽകുഞ്ഞിരാമൻ നായനാർ, ഇ.വി.കൃഷ്ണപ്പിള്ള, എം.ആർ.ബി, ഉറൂബ്, തകഴി, ടി.കെ.സി.വടുതല, ബഷീർ, എം.ടി., മാധവിക്കുട്ടി, വി.കെ.എൻ., സക്കറിയ, സാറാജോസഫ്, എൻ.പ്രഭാകരൻ, കെ.ആർ.മീര, സന്തോഷ് ഏച്ചിക്കാനം, പി.വി.ഷാജികുമാർ, പ്രിയ.എസ്. തുടങ്ങിയ എഴുത്തുകാരുടെ സംഭാവനകൾ–കഥാകഥനരീതി, പ്രത്യയശാസ്ത്രപരികല്പനകൾ, ആഖ്യാനത്തിലെ സവിശേഷതകൾ–സാംസ്കാരികമായ അടയാളപ്പെടുത്തലുകൾ–

മൊഡ്യൂൾ – 4

മലയാളഭാഷ–സാഹിത്യവിമർശനം–ഉദ്ഭവം–വളർച്ച–സമീപനരീതികൾ–
പാശ്ചാത്യപൗരസ്ത്യ സിദ്ധാന്തങ്ങളുടെ സ്വാംശീകരണം–വർത്തമാനകാലവിമർശനത്തിന്റെ കൈവഴികൾ–

മലയാള സാഹിത്യവിമർശനത്തിന്റെ പ്രാരംഭഘട്ടം–പത്രമാസികകൾ–ഏ.ആർ., പി.കെ.നാരായണപ്പിളള, സ്വദേശാഭിമാനി രാമകൃഷ്ണപ്പിളള, സി.പി.അച്യുതമേനോൻ തുടങ്ങിയവരുടെ വിമർശനരീതി.

നവോത്ഥാനഘട്ടം–കേസരി ബാലകൃഷ്ണപിളള, എം.പി.പോൾ, മാരാർ, മു□ ശ്ശേരി തുടങ്ങിയവരുടെ സംഭാവനകൾ.

മലയാളനിരൂപണത്തിന്റെ ആധുനികഘട്ടം; അഴീക്കോട്, എം.എൻ.വിജയൻ, എം.ലീലാവതി, കെ.പി.അപ്പൻ, വി.രാജകൃഷ്ണൻ, ആഷാമേനോൻ തുടങ്ങിയവരുടെ സമീപനരീതികൾ.

പുതിയ പ്രവണതകൾ–വി.സി.ശ്രീജൻ, പി.കെ.രാജശേഖരൻ, ജി.മധുസൂദനൻ, പി.പവിത്രൻ, സുനിൽ പി ഇളയിടം, ഇ.വി.രാമകൃഷ്ണൻ തുടങ്ങിയവരുടെ നിലപാടുകൾ–സാമാന്യപരിചയം.

മൊഡ്യൂൾ – 5

മലയാളസാഹിത്യചരിത്രം–പാട്ട്–മണിപ്രവാളം–ഗാഥ–കിളിപ്പാട്ട്–ചമ്പു–ആട്ടക്കഥ–തുള്ളൽ വെണ്മണി–മഹാകാവ്യം, ഖണ്ഡകാവ്യം തുടങ്ങിയ പ്രസ്ഥാനങ്ങൾ–നാഴികക്കല്ലുകളായ കൃതികൾ – ഇതിവൃത്തസ്വീകരണം–പ്രതിപാദനരീതികൾ–ഭാഷാപരമായ പ്രത്യേകതകൾ.

മൊഡ്യൂൾ – 6

ഭാഷാശാസ്ത്രം–വ്യാകരണം/ഭാഷ–നിർവ്വചനം–സാമാന്യലക്ഷണങ്ങൾ, ഭാരത്തിലെ ഭാഷകളും
ഗോത്രങ്ങളും–സ്വനം–സ്വനിമം–രൂപിമം–വ്യാകരണനിർവചനം–ഭാഷോല്പത്തി–വർണം
അക്ഷരം–വർണവികാരം–സന്ധി–നാമം–ലിംഗം–വചനം–വിഭക്തി–സമാസം
(കേരളപാണിനീയം അടിസ്ഥാനമാക്കി) തുടങ്ങിയവ സാമാന്യാവലോകനം.

മൊഡ്യൂൾ – 7

കേരളത്തിന്റെ
സാംസ്കാരികചരിത്രം–ദേശീയപ്രസ്ഥാനം–പ്രക്ഷോഭങ്ങൾ–സാമൂഹികവും
രാഷ്ട്രീയവുമായ മുന്നേറ്റങ്ങൾ–ഫോക്‌ലോർ–ഫോക്‌ലോർ ജനുസ്സുകൾ–ഫോക്‌ലോറിസം – മെറ്റാ ഫോക്‌ലോർ–പ്രായോഗികഫോക്‌ലോർ–സാമാന്യപരിചയം.

മൊഡ്യൂൾ – 8

മാധ്യമപരിചയം–വിവരസാങ്കേതികവിദ്യാവികസനം–മാധ്യമചരിത്രം–ഇന്ത്യയിലും കേരളത്തിലും–വാർത്തകളുടെ സ്വഭാവം, റിപ്പോർട്ടിംഗ്
സിറ്റിസൺജേർണലിസം–കമ്പ്യൂട്ടർ–ഹാർഡ് വേർ–സോഫ്റ്റ്‌വേർ–ഇന്റർനെറ്റ്–ഇന്റർനെറ്റ് സേവനമേഖലകൾ – ഇ–വായന, ഇ–എഴുത്ത്, ഇ–നി□ ു, ബ്ലോഗ് സാഹിത്യം, സൈബർ ആക്ടിവിസം–പൊതുധാരണ.

PGQP08

Entrance Test for the Course(s): M.A. (Punjabi) [CUPUN]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

1. **ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਅਤੇ ਸਾਹਿਤ**: ਬੁਨਿਆਦੀ ਸੰਕਲਪ
2. **ਮੱਧਕਾਲੀ ਪੰਜਾਬੀ ਸਾਹਿਤ**: ਗੁਰਮਤਿ, ਸੂਫ਼ੀ, ਕਿੱਸਾ ਅਤੇ ਬੀਰ ਸਾਹਿਤ
3. **ਆਧੁਨਿਕ ਪੰਜਾਬੀ ਸਾਹਿਤ**: ਕਵਿਤਾ, ਨਾਵਲ, ਕਹਾਣੀ, ਨਾਟਕ, ਨਿਬੰਧ ਆਦਿ
4. **ਪ੍ਰਮੁੱਖ ਪੰਜਾਬੀ ਕਵੀ ਅਤੇ ਲੇਖਕ**: ਬਾਬਾ ਫ਼ਰੀਦ, ਗੁਰੂ ਨਾਨਕ, ਵਾਰਸ ਸ਼ਾਹ, ਨਾਨਕ ਸਿੰਘ, ਗੁਰਬਖਸ਼ ਸਿੰਘ ਪ੍ਰੀਤਲੜੀ, ਪ੍ਰੋ. ਪ੍ਰੀਤਮ ਸਿੰਘ, ਬਲਵੰਤ ਗਾਰਗੀ, ਕੁਲਵੰਤ ਸਿੰਘ ਵਿਰਕ, ਸ਼ਿਵ ਕੁਮਾਰ ਬਟਾਲਵੀ, ਗੁਰਦਿਆਲ ਸਿੰਘ, ਦਲੀਪ ਕੌਰ ਟਿਵਾਣਾ, ਪਾਸ਼, ਸੁਰਜੀਤ ਪਾਤਰ, ਅਜਮੇਰ ਔਲਖ
5. **ਤੁਲਨਾਤਮਕ ਸਾਹਿਤ**: ਸੰਕਲਪ ਅਤੇ ਪ੍ਰਕਿਰਤੀ
6. ਪੰਜਾਬੀ ਲੋਕਧਾਰਾ ਅਤੇ ਸਭਿਆਚਾਰ
7. ਭਾਰਤੀ ਅਤੇ ਵਿਸ਼ਵ ਸਾਹਿਤ ਬਾਰੇ ਮੁਢਲੀ ਜਾਣਕਾਰੀ
8. ਸਾਹਿਤਕ ਜਗਤ ਦੇ ਸਮਕਾਲੀ ਮਸਲੇ, ਪ੍ਰਵਿਰਤੀਆਂ, ਘਟਨਾਵਾਂ, ਇਨਾਮ ਸਨਮਾਨ ਆਦਿ

PGQP09

Entrance Test for the Course(s): M.A. (Classical Tamil Studies) [CUTND]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

Unit-I: History of Tamil Literature: Introduction to Literature: From Classical period to Modern period: Sangam – Post Sangam – Pallava period-Chola period-Nayakka period and Bhakti Movement and Modern Period.

Unit-II: Texts on Tamil Grammar: Ezhuttu (Phonology), Col (Morphology)- (Nannu:l) Porul Grammar (Nambiagappourl)- Ani (Figure of Speech- Thandiyalankaram)– Yappu (Prosody - Yapparunkalakka:rikai).

Unit-III: Elements of General Linguistics and History of Tamil Language: Phonology, Morphology, Syntax and Semantics - History of the Indian Language families - Place of Tamil Language amongst the Indian Languages. Kinds of Dravidian Languages. Borrowing words in Tamil, Difference of Spoken and Written language and Dialects.

Unit-IV: History and Culture of Tamil Nadu: Evidences which help to know the history of Tamil Nadu, Period of Sangam, period of Kalapras, Period of Later Chola and Pandya, period of Nayakka, Period of European, political, social and religion conditions.

Unit-V: Literary Criticism: Modern Critical Theories. To describe some literary forms like Short stories, Novel, Prose and Drama through the principle of literary criticism.

Unit-VI: Tamil Literature and other disciplines: Elements of Folklore, Computer application, Journalism.

Unit-VII: Knowledge of Classical Tamil Texts: A few Agam and Puram Poems.

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PGQP10

Entrance Test for the Course(s): M.A. (Kannada) [CUKER], [CUKNK]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

Halegannada, Nadugannada, Hosagannada Sahitya, Shasana Shastra, Kavya meemamse, Bhashashastra, Janapada Sahitya, Sahitya Vimarshe, Chandassu, Vyakarana, Dalitavada, Streevada, Samskritika Adhayayana, Bhashantara, Toulanika Adhyayana

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PGQP11

Entrance Test for the Course(s): M.A. (History and Archaeology) [CUHAR], (History) [CUKNK], [CUPUN], [CUSBR], [CUTND]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

Ancient History of India (10000 BC to 1206 AD)

Stone Age (Paleolithic, Mesolithic and Neolithic age), Chalcolithic Age, Indus Vally Civilization, Aryan & Vedic Age, State formation in Ancient India, Rise of Ancient Indian Empire (Haryank, Shishunag, Nanda Dynasty), Age of Religion (Buddhism & Jainism), Mauryan Age (Social, Political and Culture), Post - Mauryan Period (Indo-Greeks, Sakas, Kushanas, Western Kshatrapas), Early State and Society in South India (Kharavela, The Satavahanas, Tamil States of the Sangam Age; Administration, economy, art and architecture). Guptas, Vakatakas and Vardhanas (Administration, Society and Culture), Regional States during Gupta Era: The Kadambas, Pallavas, Chalukyas of Badami; Polity and Administration, Literature; growth of Vaishnava and Saiva religions. Palas, Senas, Rashtrakutas, Paramours, Polity and Administration.

Early Medieval India (750 AD- 1206 AD)

Major political developments in Northern India, the rise of Rajputs; The Cholas: administration, village economy and society; Indian Feudalism; Agrarian economy and urban settlements; Trade and commerce.

Medieval History of India (1206-1707 AD)

Establishment of Delhi-Sultabanate Rule (Mamulak, Khilji and Tughlaq dynasty), Administration of Delhi Sultanate (Military reform, Iqta system etc.), Art & Architecture Vijaynagar and Bahamani Kingdom (Rise, Social, Economic and Administration), Bhakti movement, Sufi Movement; Culture: Persian literature, Establishment of Mughal Empire (Administration, Society, Political and literature), Expansion of Mughal Empire (Babar to Aurangazeb), Rise of Sur dynasty, Decline of Mughal Empire.

Modern History of India (1707 to 1947)

Modern Historiography, Colonialism in India, British Raj & British Expansion in India, Imperialism, Social and Cultural Development, Structure of British administration (all Acts), Economic impact in British Period(Settlement) , Industrialization, Social and Religious Reform movement (Ram Mohan Rai, Swami Dayanand, Jyoiba Phule etc.), National movement in India, Mass movement and British Rule, Indian National Congress summit, Gandhian movement,

Constitutional Development, Struggle for Freedom. European History, French, England, American and Russian Revolution, World War First and Second.

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PGQP12

Entrance Test for the Course(s): MPA (Vocal Music) [CUJHD], (Performing Arts) [CUKNK]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

I. Appreciation of Music, History of Indian Music, Indian Musicians and their biography, Classification of Music.

II. Hindustani Music: Bada Khayal and Chhota Khayal, Concepts of Ragas and Tala in Indian music, Classification of Ragas, Concert Singing, Thappa, Thumari, Kajari, Different Gharanas and their history, Evolution of Notation system, classical texts in music.

III. Forms of Light Music: Bhavageet and folck music.

IV. **Music & Literature**: Classical texts in music, modern texts in music, Place of Music in Fine Arts.

V. **Musical instruments**: Laws of Acoustics, Musical Sound, Wave Motion, Frequency, Pitch and Volume.

VI. **Carnatic and Hindustani instruments**: Working principle and differences, percussion and non-percussion instruments. Folk instruments of India.

VII. **Dance**: Natya and its basics, forms, mudra, Indian styles of dance. Classic texts in dance. Tala in dance.

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PGQP13

Entrance Test for the Course(s): MPA (Theater/Dance/Music/ Drama) [CUPUN], (Theatre Arts) [CUJHD]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Dramatic literature of East and West, Modern plays and playwrights, Acting Techniques, Major directors of India and abroad, Current trends in Performing Arts, Performing Arts institutions, Famous Films and directors, Theatre Design like: Light, Costume, set design.

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PGQP14

Entrance Test for the Course(s): M.A. (Sanskrit) [CUHAR]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

घटकम्–1 (Unit-1): संस्कृतसाहित्येतिहासः– History of Sanskrit Literature

वैदिकसंहिता, ब्राह्मणग्रन्थाः, आरण्यकग्रन्थाः, उपनिषदः, वेदाङ्गानि, दर्शनानि, रामायणम्, महाभारतम्, पुराणानि।

कवयः तेषां कृतयश्च– भासः, अश्वघोषः, कालिदासः, भारविः, भट्टिः, शूद्रकः, भवभूतिः, सुबन्धुः, माघः, बाणभट्टः, दण्डी, श्रीहर्षः, कल्हणः ।

Vaidikasaṁhitās, Brāhmaṇagranthas, Ārayaṇyakagranthas, Upaniṣads, Vedāṅgas, Darśanas, Rāmayaṇam, Mahābhāratam, Purāṇas.

Poets and their Works: Bhāsa, Aśvaghoṣa, Kālidāsa, Bhāravi, Bhaṭṭi, Śūdraka, Bhavabhūti, Subandhu, Māgha, Bāṇabhaṭṭa, Daṇḍī, Śrīharṣa, Kalhaṇa.

घटकम्–2 (Unit-2) संस्कृतव्याकरणम् (Sanskrit Grammar)

शब्दरूपाणि, धातुरूपाणि, सन्धिः, समासः, कारकाणि, स्त्रीप्रत्ययाः, कृदन्ताः, तद्धिताः।

Śabdarūpas, Dhāturūpas, Sandhi, Samāsa, Kārakas, Strīpratyas, Kṛdantas, Taddhitas.

घटकम्–3 (Unit-3) संस्कृतकाव्यशास्त्रं छन्दशास्त्रञ्च (Sanskrit Poetics and Prosody)

आलङ्कारिकाः – भरतः, भामहः, दण्डी, वामनः, आनन्दवर्धनः, कुन्तकः, मम्मटः, क्षेमेन्द्रः, विश्वनाथः। प्रसिद्धाः अलङ्काराः, प्रसिद्धानि छन्दांसि, नाट्यतत्वम्, रसनिष्पत्तिः।

Ālaṅkārikas-: Bharata, Bhāmaha, Daṇḍī, Vāmana, Ānandavardhana, Kuntaka, Mammaṭa, Kṣemendra, Viśvanātha. Prominent Alaṅkāras, Prominent metres, Nāṭyatattva, Rasaniṣpatti.

घटकम्–4 (Unit-4) संस्कृतसाहित्यग्रन्थाः (Sanskrit Literary Works)

अभिज्ञानशाकुन्तलम्, मेघदूतम्, श्रीमद्भगवद्गीता, भर्तृहरिकृतं नीतिशतकम्, हितोपदेशः

Abhijñānaśākuntalam, Meghadūtam, Śrīmadbhagavadgītā, Nītiśatakam of Bhartṛhari, Hitopadeśa

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PGQP15

Entrance Test for the Course(s): M.A. (Sociology) [CUGUJ], [CUHAR], [CUPUN], [CUSBR]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Basic Concepts in Sociology
UNIT – I: Sociology: Definition, nature and scope; Relationship with other Social Sciences: Psychology, Anthropology, History, Economics, Political Science.

UNIT – II: Basic Concepts: Social Structure, Society, Social Organization, Community, Association, Norms, Values.

UNIT – III: Status and Role: Types of status and role and their interrelation

UNIT – IV: Socialization: Meaning, types, processes and agencies. Theories of self (Freud, Cooley and Mead) Culture: Meaning, characteristics; material and non-material culture; cultural lag; culture and civilization.

Social Process and Problems
UNIT – I: Social Processes: Cooperation, Accommodation, Assimilation and Competition and Conflict.

UNIT – II: Social Groups: Definition, characteristics, types (primary and secondary; in-group and out-group; Reference group and Peer group).

UNIT – III: Social Institutions: Marriage; Family; Kinship; Education; Religion and economy (Meaning and functions) and Religion: Meaning and Functions.

UNIT – IV: Social Control: Meaning, Significance and agencies. Social Deviance: Meaning, characteristics, forms and factors.

Society, Culture and Social Change
UNIT – I: Societies: Types and Characteristics- Tribal, Rural, Urban, Industrial and Post-Industrial.

UNIT – II: Culture: Definition and Nature; Types- Material and Non- Material. Socialization: Its importance, Process and Stages. Social Control: Its Types and Means.

UNIT – III: Processes of Social Change: Characteristic Features of Industrialization, Modernization, Globalization and Secularization.

UNIT – IV: Social Stratification: types, theories of stratification and mobility and its types

Indian Society

UNIT – I: Evolution of Indian Society: Traditional bases of Indian Society; Unity and Diversity in India; India as a Pluralistic Society.

UNIT – II: Caste, theories and Caste system and its Changing Dimensions in India and Dominant caste.

UNIT – III: Processes of Social Change in India: Sanskritization, Westernization, modernistion Parochiatization and Universatization.

UNIT – IV: Social Issues and Problems: Gender Discrimination, Secularism and Religious Minorities, Problems of Dalits Women and OBC and Affirmative Actions.

Social Research

UNIT – I: Social Research: Definition, Nature and purpose; Steps in Social Research; Problem of Objectivity and Subjectivity in Social Research

UNIT – II: Research Method: Research Designs; Social Survey; Hypothesis- Types & significance; Sampling and Sampling Procedure

UNIT – III: Techniques of Data Collection: Types of Data; Techniques- Observation, Interview, Questionnaire, Schedule and Case Study

UNIT – IV: Statistical Analysis and Use of Computer in Social Research: Classification and Tabulation of data; Measures of Central Tendency: Mean, Median and Mode; Use of Computers in Social Research.

Social Problems in India

UNIT – I: Social Problem: Meaning and Definition; Importance of the Study of Social Problems; Sociological Perspectives on Social Problem-Anomie and suicide (Durkheim) Labeling (Becker).

UNIT – II: Structural Issues: Inequality of Caste, Class Gender and Ethnicity; Communalism; Problems of Minorities.

UNIT – III: Problems and Issues: Female Foeticide, Dowry, Domestic Violence, Divorce; Problems of Aged.

UNIT – IV: Social Disorganization: Crime and Juvenile Delinquency, Corruption, Drug Addiction, Suicide, nepotism, Prostitution and AIDS

Social Change and Development

Unit –I: Social Change: Concept, Forms and Factors;. Theories of Social Change: Linear (Spencer), Cyclical (Pareto), Fluctuation (Sorokin); Conflict Theory (Marx).

Unit –II: Social Change in Contemporary India: Trends and Processes of Change – Sanskritisation, Westernization, Modernization and Secularization

Unit – III: Development Programmes in India: Development Programme in India; The Five Year Plans, Community Development Programme, , Panchayat Raj; Impact of new Panchayati Raj on Women Empowerment.

Unit– IV: Concept and Features of Development.

Foundations of Social Thought

UNIT – I: Positivism: Comte's Law of three stages, Social Static & Dynamics, Evolutionism-Spencer's Evolutionary Approach.

UNIT – II: Functionalism: Durkheims' Concept of Social Fact, Division of labour in Society; Radcliffe Brown's Structural-Functional Approach.

UNIT – III: Conflict: Marx's concept of Dialectical Historical Materialism, Class & Class Conflict; Coser's Approach to Social Conflict.

UNIT – IV: Internationalism: Weber's Interpretative Sociology; Types of Social Action; G.H.Mead's Concept of Self & Society.

Rural Society: Structure and Change

UNIT – I: Introduction to Rural Sociology: Origin, Nature, Subject Matter and Importance.

UNIT – II: Rural Social Structure: Caste and Class in Rural Set Up, Inter Caste Relation with reference to Jajmani System; Rural family and changing pattern.

UNIT – III: Rural Economy: Land Tenure System, Land Reforms; Green Revolution and Its Impact; Bonded and Migrant Labourers; Major Changes in Rural Society.

UNIT – IV: Rural Political Structure: Traditional Caste and Village Panchayats; Panchayati Raj before and after 73rd Constitutional Amendment, Panchayati Raj and Empowerment of Women.

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PGQP16

Entrance Test for the Course(s): M. Tech. (Transport Science and Technology) [CUJHD]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

I. Engineering Mathematics: Linear algebra, calculus, ordinary differential equation, partial differential equation, probability and statistics, numerical methods

II. Transportation Engineering: Highway alignment and engineering surveys, Geometric design of highways, railway track, airport runway length, and taxiway. Highway materials-desirable properties, factors affecting flexible and rigid pavements; Traffic studies on flow, speed, travel time - delay and O-D study, PCU, peak hour factor, parking study, accident study and analysis, statistical analysis of traffic data.

III. Construction Technology and Management: Construction Materials: Structural steel - composition, material properties and behavior, concrete constituents, mix design, short-term and long-term properties, bricks and mortar; timber, bitumen. Construction Management: Types of construction projects, tendering and construction contracts.

IV. Surveying: Principles of surveying: errors and their adjustments, Maps - scale, coordinate system, Distance and angle measurement - Levelling and trigonometric levelling, Traversing and triangulation survey, Total station, horizontal and vertical curves.

V. Geotechnical Engineering: Classification of soils, Effective stress principle, Permeability and Compressibility of soils, Seepage and flow nets, shear strength of soils, compaction of soils. Earth pressure theories, different earth retaining structures, Shallow and deep foundations: Terzaghi's bearing capacity theory, Load carrying capacity of piles, Foundation design; Stability of slopes. Different tests on soil.

VI. Environmental Engineering: Population Forecasting and Water Demand, Physical, Chemical and Biological Characteristics of Water and Wastewater, Wastewater Flow, Sewerage system and sewer design. Introduction to Environmental Chemistry, Equilibrium Constant and Solubility Products, pH and Alkalinity. Flow sheets for Water and Wastewater Treatment, Municipal Solid Wastes, introduction to Solid Waste, Air Pollution and Noise Pollution.

VII. Solid Mechanics: Bending moment and shear force in statically determinate beams, Simple stress and strain relationships, theories of failures, simple bending theory, flexural and shear stresses, shear centre, uniform torsion, buckling of column, combined and direct bending stresses.

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PGQP17

Entrance Test for the Course(s): M.Sc. (Geography) [CUHAR], [CUTND]. M.A./ M.Sc. (Geography) [CUJHD], [CUPUN]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Unit-I: Physical Geography: Lithosphere

The nature and scope of Physical Geography. Solar system and the Earth; Origin of the earth - important theories - Nebular, Tidal, Planetesimal, Supernova and Otto Schmidt.

The constitution of the earth's interior, Age of the earth, Geological time scale. Origin of the Continents and Oceans: Wegner's theory. Plate tectonics and Earth surface configuration, major and minor plates of the world and types of plate margins

Major second order Land forms: Mountains, Plateaus, Plains and Lakes their classification and distribution.

Earth's Materials: Rocks- their origin, classification and characteristics, Formation of regolith and soil.

Unit-II: Elements of Geography
Nature and scope of Geography. A brief historical overview of Geography as a discipline. Dualism in geography- Physical v/s Human. Branches of Physical Geography- their general characteristics and inter-relationships. Branches of Human Geography- their general characteristics and interrelationships.

Geography as the study of Environment. Man – Environment relationship, ecology and ecosystem. Environmental hazards and assessment. Branches of Human Geography – their general characteristics.

Elements of Map Science. Concepts of Scale and Maps, Toposheets and Application of Remote Sensing Techniques. Application of Geography in various fields such as agriculture. Mining, Resource evolution. Recent Trends in Geography.

Unit-III: The nature and scope of cartography. Types of Maps and Scientific method of letter writing. Scale: Statement scale, Representative Fraction (R.F.) and Graphical scale.

Construction of Graphic / Linear Scale: Simple, Comparative, Diagonal and Time scale.

Enlargement and reduction of Maps: Graphical – Square & Similar Triangle Method; Mechanical methods.

Identification of different rocks: Igneous, Sedimentary and Metamorphic Granite, Basalt, Pegmatite, Conglomerate, Sandstones, Limestone, Marble, Gneiss Schist, Slate 2.

Unit-IV: Geomorphic agents and processes: Fluvial, Arid and Karst region. Endogenetic process: orogenetic and epeirogenetic; Folds, Fault, Dome and their resultant landforms.

Earth dynamics: Earthquakes and Volcanic activities, causes, their resultant landforms and world distribution. Exogenetic processes of earth- Weathering processes: Physical, Chemical and Biological. Mass wasting and their resultant landforms.

Geomorphic hazards: Earthquake, Volcanic eruption, Landslide and Flood – their effects and assessment. Application of geomorphology in settlements, mining, landuse, transport -road and railway lines.

Unit-V: Human Geography
Nature and scope of human Geography. Division of Mankind into racial groups their characteristics and distribution. Human Adaptation to the environment (i) Cold region- Eskimo (ii) Hot region- Bushman, Badawins (iii) Humid region-Pigmy

Human adaptation to the environment (i) Plateau-Gonds, Massi (ii) Mountain- Gujjars nomads, (iii)Regions of recurrent floods, droughts and other cultural hazards, Adaptation in modern society.

Distribution and density of population: Factors of population distribution – physical, social and economic. Distribution of world Population. Growth of Population.

Migration- internal and international, Settlements-rural and urban, patterns and world distribution.

Population conflict resolution in developed and developing world. Geo-political conflicts. Frontiers and Boundaries, Indian ocean and World politics.

Unit-VI: Diagrammatic Representation of geographical data-types of diagram's, bar and column charts. Simple Line graph and Compound graph.

Methods of showing relief- (Hachure, Shading, and Contours). Representation of different landforms by contours. Contours interpolation. Drawing of profiles cross and long profiles and their relevance in landforms mapping and analysis.

Surveying- Basic principles of surveying; Types of surveying, surveying by chain and tape: one and two base lines (Tie line).

Unit-VII: Physical Geography: Climatology
Definition and significance of climatology. Elements of weather and climate, composition and structure of the atmosphere.

Atmospheric pressure and winds -vertical and horizontal distribution of pressure, Winds and their causes of circulation, Types of winds-planetary, Periodic and local winds. El-Nino-Southern Oscillation (ENSO).

Atmosphere moisture -Humidity, Evaporation and condensation. Hydrological cycle, Types of precipitation: World patterns of rainfall, regional and seasonal distribution of rainfall.

Air masses and Fronts- Origin, classification and characteristics. Atmospheric disturbances: Cyclone- Tropical cyclone, temperate cyclone-theories of their origin and associated weather conditions.

Climatic classification. Basis of Koppen's classification and their climatic types. Role of climate in human life, Atmospheric pollution and global warming- general causes, consequences and measures of control.

Unit-VIII: Economic Geography
Definition and scope of economic geography. Sectors of economic activity-Primary, Secondary and Tertiary. Agriculture: Primary crops – wheat, rice and maize.

Agriculture: commercial crops – cotton, sugarcane, tea, coffee, rubber. Favourable geographical conditions, world distribution and production. Fishries – factors and important fishing grounds.

Fuel and Power resources of the world. world distribution and production of coal, petroleum and hydroelectric power. World potential and development of atomic energy and non-conventional sources of energy.

Unit-IX: Representation of Temperature pressure and Rainfall data, Line and Bar graph, Isotherm, Isobars and Isohyets.

Representation of statistical data - Circle diagram, Sector diagram, Age and Sex pyramid.

Classification of Indian Meteorological Observatories and method of collection of weather data. Construction and significance of Climograph and Hythergraph.

Unit-X: Physical Geography: Oceanography
Significance of Oceanography, surface configuration of the ocean floor, Hypsographic curve -continental self, continental slope, abyssal plain, trenches and deeps. Relief of Atlantic, Pacific, and Indian Oceans with illustration.

Distribution of Temperature and Salinity of oceans and seas and their importance to human life with special reference to activities of costal areas Circulation of oceanic waters, waves and currents, currents of Atlantic, Pacific and Indian oceans.

Tides –Causes, Types and Theories. Marine deposits- Coral reefs-types and their formation, theories of coral reefs formation, costal environment, ocean as store house of resources for the future.

Unit-XI: Economic Geography
Mining economy: Factors governing the exploitation of minerals. World reserves and production of Iron ore, Manganese, Bauxite and Copper.

Manufacturing industries- factors affecting location, growth and distribution of Iron and steel industry in USA, Russia, Great Britain and Germany. Factors affecting location, Growth and distribution of Cotton textile industry in USA, Great Britain, China, Japan. Woollen textile industry - location and world distribution.

Nature and trends in the International trade, World trade of wheat, cotton, tea, coffee, petroleum, gold, silver, gems and jewellery, etc.

Transport: Relative significance of different means of transport, factors affecting land, water and air transport. World oceanic routes; important inland waterways and important canals. Impact of globalization on world economy.

Unit-XII: Representation and analysis of Relief: Profile, Serial, Longitudinal, Superimposed composite, projected and their use in landform analysis,

Use of Meteorological instruments: Maximum and minimum Thermometer, Dry and Wet Bulb Thermometer, Fortin's Barometer, Aneroid Barometer, Rain Gauge, Wind Vane, Anemometer. Weather maps: Preparation of weather maps in India; Symbols used in weather maps; Interpretation of Indian daily Weather maps published by the Indian Meteorological Department.

Survey- Prismatic compass survey, Radiation and Inter-section methods.

Unit-XIII: Geography of India: Physical Aspects
Locational characteristics; land of diversities and unity in diversity; Physical features relief and physiographic character. Drainage pattern. Climate : origin of monsoon, regional and seasonal variation.

Soils types: their characteristic and distribution. Mineral resources: Iron-ore, Manganese, Bauxite and Copper.

Power resources: Coal, Petroleum, Hydroelectric power. Development of power resources; Sources of non-conventional energy. Water resources: availability, utilization, conservation methods- rain harvesting and watershed management.

Unit-XIV: Resources & Environment
Meaning, nature and components of resources and environment. Resources and environment interface. Classification of resources - renewable and non-renewable, biotic and abiotic resources.

Water resources their economic and environmental significance and conservation methods. Minerals and energy resources their economic and environmental significance and conservation.

Types and distribution of forests - their economic and environmental significance and conservation.
Major soil types and their distribution, problems of soil erosion and soil conservation.

Fisheries- their economic and environmental significance and conservation.

Unit-XV: General principles and classification of Projections: Construction, Properties, limitations and uses of following projections: Zenithal: Gnomonic, Stereographic and Orthographic projections (Polar cases).

Conical projections: One standard parallel, Two standard parallels, Bonne's and Polyconic. Simple cylindrical projection, Equal area cylindrical projection.

Mapping Techniques: Mapping of population data, Social, Economic and Physical Data employing Dot, Isopleth, and Choropleth method.

Unit-XVI: Geography of India: People and Economy
Cultural landscape: Population distribution and density, and its growth, urbanization.
Changing nature of Indian economy; Agriculture: Major crops- wheat, rice, cotton, tea; impact of green revolution, Regionalization of Indian agriculture.

Industrial development-location and distribution of iron and steel, cement, cotton textile and sugar industry.

International trade; Socio-economic development-impact of development on environment and globalization. Geography of Madhya Pradesh: Physical features, Climate, Forests, Power resources, Agriculture and Industries.

Unit-XVII: Resources and Environment
Meaning, definition and components of environment Ecology and Ecosystem. Classification of environment: Natural and Human. Human resources: Distribution and Density of Population.

Population pressure and resources utilization. Population explosion, Exploitation of natural resources, Food security. Environmental hazards: pollution and its related problems, Emerging environmental problems. Global warming.

Impact of Human activities: deforestation, mining, agriculture and industrialization on environment. Environmental conservation, preservation, and sustainable resource use.

Unit-XVIII: Statistical Methods: Measures of central tendency- Mean, Median, and Mode; Standard Deviation.

Topographic maps: classification and numbering; Interpretation of physical and cultural topographic sheets. Aerial photograph and remote sensing & GIS.

Surveying : Plane Table survey by intersection, and Resection methods. One day field excursion visit of any specific geographical unit & their report/village survey report.

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PGQP18

Entrance Test for the Course(s): M.Sc. (Geo-informatics) [CUJHD], (Applied Geography & Geo-informatics) [CUKNK]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Human Geography

- Definition, Nature, Major Subfields, Contemporary Relevance.
- Space and Society: Cultural Regions; Race; Religion and Language
- Population: Population Growth and Demographic Transition Theory.
- World Population Distribution and Composition (Age, Gender and Literacy).
- Settlements: Types and Patterns of Rural Settlements; Classification of Urban
- Settlements; Trends and Patterns of World Urbanization

General Cartography

- Maps – Types, Elements and Uses
- Map Scale – Types and Application, Reading Distances on a Map.
- Map Projections – Criteria for Choice of Projections; Attributes and Properties of: Zenithal Gnomonic Polar Case, Zenithal Stereographic Polar Case, Cylindrical Equal Area, Mercator's Projection, Conical Projection with Two Standard Parallel, Bonne's Projection.
- Representation of Data – Symbols, Dots, Choropleth, Isopleth and Flow Diagrams, Interpretation of Thematic Maps.

Environmental Geography:

- Concepts and Approaches; Ecosystem – Concept and Structure; Ecosystem Functions.
- Human-Environment Relationship in Equatorial, Desert, Mountain and Coastal Regions.
- Environmental Problems and Management: Air Pollution; Biodiversity Loss; Solid and Liquid Waste.
- Environmental Programmes and Policies: Developed Countries; Developing Countries.
- New Environmental Policy of India; Government Initiatives.

Geography of India

- Physical Setting – Location, Structure and Relief, Drainage, Climate.
- Population – Size and Growth since 1901, Population Distribution, Literacy, Sex Ratio.
- Settlement System – Rural Settlement Types and Patterns, Urban Pattern.
- Resource Base – Livestock (cattle and fisheries), Power (coal, and hydroelectricity), Minerals (iron ore and bauxite).
- Economy – Agriculture (Rice, Wheat, Sugarcane, Groundnut, Cotton); Industries (Cotton Textile, Iron- Steel, Automobile), Transportation Modes (Road and Rail).

Economic Geography

- Definition, Approaches and Fundamental Concepts of Economic Geography; Patterns of Development.

- Locational Theories – Agriculture (Von Thunen) and Industrial (Weber).
- Primary Activities – Intensive Subsistence Farming, Commercial Grain Farming, Plantation, Commercial Dairy Farming, Commercial Fishing, and Mining (iron ore, coal and petroleum).
- Secondary Activities – Cotton Textile Industry, Petro-Chemical Industry, Major Manufacturing Regions.
- Tertiary and Quaternary Activities – Modes of Transportation, Patterns of International Trade, and Information and Communication Technology Industry.

Disaster Management

- Hazards, Risk, Vulnerability and Disasters: Definition and Concepts.
- Disasters in India: (a) Causes, Impact, Distribution and Mapping: Flood, Landslide, Drought.
- Disasters in India: (b) Causes, Impact, Distribution and Mapping: Earthquake, Tsunami and Cyclone.
- Human induced disasters: Causes, Impact, Distribution and Mapping.
- Response and Mitigation to Disasters: Mitigation and Preparedness, NDMA and NIDM; Indigenous Knowledge and Community-Based Disaster Management; Do's and Don'ts During Disasters

Geography of Tourism

- Concepts, Nature and Scope; Inter-Relationships of Tourism, Recreation and Leisure; Geographical Parameters of Tourism by Robinson.
- Type of Tourism: Nature Tourism, Cultural Tourism, Medical Tourism, Pilgrimage
- Recent Trends of Tourism: International and Regional; Domestic (India); Eco-Tourism, Sustainable Tourism, Meetings, Incentives, Conventions and Exhibitions (MICE)
- Impact of Tourism: Economy; Environment; Society
- Tourism in India: Tourism Infrastructure; Case Studies of Himalaya, Desert and Coastal and Heritage; National Tourism Policy

Sustainability and Development

- Sustainability: Definition, Components and Sustainability for Development.
- The Millennium Development Goals: National Strategies and International Experiences
- Sustainable Development: Need and examples from different Ecosystems.
- Inclusive Development: Education, Health; Climate Change: The role of higher education in sustainability; The human right to health; Poverty and disease; Sustainable Livelihood Model; Policies and Global Cooperation for Climate Change
- Sustainable Development Policies and Programmes: Rio+20; Goal-Based Development; Financing for Sustainable Development; Principles of Good Governance; National Environmental Policy, CDM

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PGQP19

Entrance Test for the Course(s): M.Sc. (Geology) [CUKER], [CUPUN], [CUSBR], [CUTND], (Applied Geology) [CUKNK]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

UNIT-I

Physical Geology: Introduction to geology and its scope, Earth and solar system: origin, size, shape, mass, density and its atmosphere. A brief account of various theories regarding the origin and age of the Earth. Brief idea of interior of earth and its composition. Weathering and erosion: factors, types and their effects. arthquakes: nature of seismic waves, their intensity and magnitude scale; Origin of earthquake. Volcanoes: types, products and causes of volcanism.

Geomorphology: Basic principles of Geomorphology, geomorphological cycles, weathering and erosion; Geomorphic mapping- tools and techniques. Epigene/exogenic processes: degradation and aggradation. Hypogene/endogenic processes; Diastrophism and volcanism, Extraterrestrial processes; Geological work of wind, glacier, river, underground water and ocean.

Geodynamics: Earth as a dynamic system. Elementary idea of continental drift, sea-floor spreading and mid-oceanic ridges.Paleomagnetism and its application. Plate Tectonics: the concept, plate margins, orogeny, deep sea trenches, island arcs and volcanic arcs.

Environmental Geology: Earth and its spheres: atmosphere, hydrosphere, lithosphere, biosphere and Man; Earth Material. Energy budget: Solar radiation. Global environments: coastal, riverine, desertic, tropical, cold, polar. Concept of global warming and climate change. Geoloigcal hazards: Earthquakes, volcanism, landslides, avalanches, floods, droughts; Hazard mitigation. Resource Management: Energy resources (Conventional and non-conventional), watershed management, land use planning, management of water resources, land reclamation.

Structural Geology: Introduction to Structural Geology; contours, topographic and geological maps; Elementary idea of bed, dip and strike; Outcrop, effects of various structures on outcrop. Clinometer/Brunton compass and its use. Elementary idea of types of deformation; Folds: nomenclature and types of folds. Faults: nomenclature, geometrical and genetic classifications, normal, thrust and slip faults. Definition, kinds and significance of joints and unconformity.

Hydrology: Definition of hydrogeology, Hydrological cycle.Hydrological parameters - Precipitation, evaporation, transpiration and infiltration. Origin of groundwater; Vertical distribution of groundwater. Types of aquifers; Water bearing properties of rocks - Porosity and Permeability; specific yield, specific retention. Surface and subsurface geophysical and geological methods of ground water exploration. Groundwater provinces of India.

Physical Geography: –

1. Definition and Scope, Components of Earth System.
2. Atmosphere – Heat Balance, Global Circulation Pattern, Tropical Cyclones, Monsoon, Climatic Classification (Koppen).

3. Lithosphere – Internal Structure of Earth based on Seismic Evidence, Plate Tectonics and its Associated Features.
4. Fluvial Cycle of Erosion – Davis and Penck.
5. Hydrosphere – Hydrological Cycle, Ocean Bottom Relief Features, Tides and Current

Fundamentals of Remote sensing & GIS: Remote sensing systems; remote sensing sensors; signatures of rocks, minerals and soils. Application of remote sensing in geoscience and geomorphological studies. Types of Indian and Foreign Remote Sensing Satellites, Digital image processing; fundamental steps in image processing; elements of pattern recognition and image classification. Introduction to Geographic Information System (GIS); components of GIS; product generation in GIS; tools for map analysis; integration of GIS with remote sensing.

UNIT-II

Crystallography: Crystals and their characters, form, face, edge, solid angle; Interfacial angle and their measurements; Crystallographic axes and angles. Crystal parameters, Weiss and Miller system of notations. Symmetry elements and description of normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic systems.

Mineralogy: Introduction to Mineralogy, Definition and characters of mineral. Physical properties of minerals. Chemical composition and diagnostic physical properties of minerals such as: Quartz, Orthoclase, Microcline, Hypersthene, Hornblende, Garnet, Muscovite, Biotite, Chlorite, Olivine, Epidote, Calcite. Polarizing microscope, its parts and functioning; Ordinary and polarized lights; Common optical properties observed under ordinary, polarized lights and crossed nicols. Optical properties of some common rock forming minerals (Quartz, Orthoclase, Microcline, Olivine, Augite, Hornblende, Muscovite, Biotite, Garnet, Calcite).

Geochemistry: Introduction to geochemistry: basic knowledge about crystal chemistry. Types of chemical bonds, coordination number; Colloids in geological systems, ion exchanges and geological evidence for earlier colloids. Elementary idea of Periodic Table. : Cosmic abundance of elements; Composition of the planets and meteorites; Geochemical evolution of the earth and geochemical cycles. Gold Schmidt's geochemical classification of elements; Distribution of major, minor and trace elements in igneous, metamorphic and sedimentary rocks. Elements of geochemical thermodynamics; Isomorphism and polymorphism.

Petrology: *Igneous Petrology*: Magma: definition, composition, types and origin; Forms of igneous rocks; textures of igneous rocks. Reaction principle; Differentiation and Assimilation; Crystallization of unicomponent and bicomponent (mix-crystals) systems; Bowen's reaction series. Mineralogical and chemical classification of igneous rocks. Detailed petrographic description of Granite, Granodiorite, Rhyolite, Syenite, Phonolite, Diorite, Gabbro. Processes of formation of sedimentary rocks; Classification, textures and structures of sedimentary rocks. Petrographic details of important siliciclastic and carbonate rocks such as - conglomerate, breccia, sandstone, greywacke, shale, lime stones. Process and products of metamorphism; Type of metamorphism. Factors, zones and grades of metamorphism. Textures and structures of metamorphic rocks.Classification of metamorphic rocks. Petrographic details of some important metamorphic rocks such as - slate, schists, gneiss, quartzite, marble.

Economic Geology: Concept of ore and ore deposits, ore minerals and gangue minerals; Tenor of ores; Metallic and non-metallic ore minerals; Strategic, Critical and essential minerals. Processes of formation of ore deposits; Magmatic, contact metasomatic, hydrothermal, sedimentation.Study of important metallic (Cu, Pb, Zn, Mn, Fe, Au, Al) and non-metallic (industrial) minerals (gypsum, magnesite, mica). Distribution of coal and petroleum in India.

Mineral exploration: Elementary idea of geological, geochemical and geophysical prospecting. Elementary idea of mining and environmental considerations for mining,.

Stratigraphy: Definition, Principle of stratigraphy; Geological Time Scale and stratigraphic classification; Physiographic division of India. Study of following Precambrian succession: Dharwar, Cuddapha, Vindhyan and Delhi Supergroups; Brief idea of Palaeozoic succession of northwestern Himalaya; Triassic of Spiti; Mesozoic type seccession of Kutch and Rajasthan; Cretaceous of Tiruchirapalli. Study of following type localities: Gondwana and Deccan Trap. Palaeogene-Neogene sequences of northwest Himalaya and Assam.

Palaeontology: Definition, Fossils: definition, characters, binomial nomenclature in taxonomy, mode of preservation, condition of fossilization and significance of fossils. Morphology and geological distribution of brachiopods, pelecypods, cephalopods. Morphology and geological distribution of trilobite, echinoidea. Evolutionary history of horse. Morphology, distribution and significance of Gondwana flora.

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PGQP20

Entrance Test for the Course(s): M.A. (Social Work) [CUGUJ], [CUJAM], [CUSBR], MSW (Social Work) [CUKER], [CUKNK], [CURAJ], [CUTND], (Tribal Welfare and Justice) [CUJHD]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Unit – I: Social concepts: family, marriage, neighborhood, community, organization, culture, caste, clan, values, culture, traditions, practices, norms, lifestyle, health, socialization, needs.

Unit – II: Economic concepts: economy, market, production, distribution, demand, supply, labor, income, expenditure, globalization, privatization, liberalization, industrialization.

Unit – III: Political concepts: politics, democracy, decentralization, panchayat, legislature, executive, judiciary, human rights, social justice, freedom, liberty, fundamental rights & duties.

Unit – IV: Psychological concepts: individual, self, behavior, mental functions, attitude, emotions, beliefs, self-esteem, intelligence.

Unit – V: Environmental concepts: environment, atmosphere, pollution-air, water, sound; natural resources - air, water, soil, forest; disaster.

Unit- VI: Legal concepts: constitution, law, petition, litigation, First-hand information report (FIR).

Unit –VII: Social reform, social movement, social work: Concepts: social reform, social movement, revolution, satyagraha, non-violence, truth, justice, peace, social work, social development;
Bhakti movement – Guru Nanak, Kabir, Basaveshwar;
Social reformers – Rajaram Mohan Roy, Swami Vivekanand, Dhondo Singh Karve;
Freedom movement – Gandhi, Subhaschandra Bose;
Dalit & Social movement – Ambedkar, Medha Patkar, Anna Hazare, Aaruna Roy; Non-government organizations, Corporate.

Unit – VIII: Social change and Social transformation: Concepts: social change, social transformation.

Unit – IX: Sustainable technologies: Forms of sustainable technologies: solar, wind, bio-gas, bio-mass, bio-diesel; Pollution control through technologies.

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PGQP21

Entrance Test for the Course(s): M. Arch. (Sustainable Architecture) [CURAJ]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

I. Mathematics (basic understanding as applicable for sustainable architecture)

II. General awareness about Ecology, Environment, Climate Change, Renewable energy.

III. Vernacular, Traditional and Recycled Materials in context of Sustainable Architecture.

IV. Contemporary and famous examples of sustainable / energy efficient architecture / settlement planning across the world.

V. Climatology and Climate Responsive Architecture – Vernacular, Traditional and Modern.

VI. Building Services and Utilities – Electrical, HVAC, Sanitary and Plumbing, Solid and Liquid Waste Management (with special reference to energy efficiency, recycling and re-use).

VII. Water Conservation, harvesting and recharge – Traditional and Modern Methods.

VIII. Overview of Green Buildings rating systems.

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PGQP22

Entrance Test for the Course(s): M.Sc. (Life Science) [CUGUJ], [CUJHD], [CUKNK], [CUSBR], (Microbiology) [CUHAR], [CUPUN], [CURAJ], [CUTND], (Biochemistry) [CUHAR], [CUKER], [CUPUN], [CURAJ], (Nutrition Biology) [CUHAR], (Biotechnology) [CUHAR], [CURAJ], [CUSBR], (Zoology) [CUKER], [CUPUN], (Genomic Science) [CUKER], (Bioinformatics) [CUPUN], [CUSBR], (Botany) [CUPUN], [CUKER], (Life Sciences (Sp. in Human Genetics)) [CUPUN], (Life Sciences (Molecular Medicine)) [CUPUN]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

1. Techniques: Principles and applications of chromatography, spectroscopy, microscopy, electrophoresis, centrifugation, blotting, PCR & radioisotope techniques.

2. Chromatin structure and function: Organization of chromosomes in prokaryotes and eukaryotes, chromatin types, centromere, Telomere and concept of gene.

3. Biochemistry: Structure and functions of proteins, DNA, carbohydrates, lipids & vitamins. Bioenergetics, Glycolysis, TCA cycle, Electron Transport System and ATP synthesis, oxidation and synthesis of fatty acid, membrane structure and function.

4. Biotechnology: Recombinant DNA technology, principles of gene cloning, applications of biotechnology in medicine, industry and agriculture, animal & plant cell culture, environmental biotechnology.

5.Microbiology: Diversity of microbes, bacterial reproduction, antimicrobial agents, significance of microbes in the industry and agriculture, antigen, antibody, complement systems, immunity, vaccines, plant virus, animal virus and environmental microbiology.

6. Molecular Genetics: Principles of inheritance, linkage & crossing over, chromosomal aberrations, extrachromosomal inheritance, replication, transcription, translation, DNA repair and population genetics.

7. Plant Sciences: Bryophytes, Pteridophytes, Gymnosperms, Angiosperms, Vascular system in plants, Economic important of plants, Photosynthesis, Photoperiodism, Vernalization, and Biogeochemical cycle.

8. Animal Sciences: Characteristics of invertebrates and vertebrates, anatomy and physiology of different system of humans, nerve impulse transmission, endocrinology, human diseases Apoptosis and cancer, inherited diseases, animal cell culture.

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PGQP23

Entrance Test for the Course(s): M.A. (Telugu) [CUAPH]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

1. ప్రాచీన తెలుగు సాహిత్యము – చరిత్ర- సంస్కృతి

అనువాద యుగము (కావ్యేతిహాసయుగము), ప్రబంధయుగము , దక్షిణాంధ్రయుగము, వివిధ ప్రక్రియలు

2. ఆధునిక తెలుగు సాహిత్యము

వివిధ ప్రక్రియలు – కవిత్వము, కథ,కథానిక, నవల,నాటకం, స్వీయచరిత్రలు

వివిధ సాహిత్యశాఖలు – భావకవిత్వము, అభ్యుదయకవిత్వము, విప్లవకవిత్వము, స్త్రీవాదకవిత్వము, దళితవాద

కవిత్వము, మైనారిటీ వాద కవిత్వము, అస్తిత్వవాదకవిత్వము, మానవతావాదకవిత్వము, హేతువాదకవిత్వము.

3. జానపదసాహిత్సము

గేయ వచన ప్రదర్శనకళా శాఖలు

4. భాషా వ్యాకరణములు

తెలుగు భాషాపరిచయం, వ్యాకరణపరిచయం – సంధి, సమాసాది సాధారణ పరిచయం

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PGQP24

Entrance Test for the Course(s): M.Pharm. (Pharmaceutical Chemistry) [CUPUN], [CURAJ], (Pharmaceutics) [CURAJ], [CUSBR], (Pharmacology) [CUHAR], [CUPUN], [CUSBR], (Pharmacognosy) [CUPUN]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

PHARMACEUTICS-I (INTRODUCTION TO PHARMACEUTICS)

1. History of pharmaceutical practice through ages, pharmacy as a career.
2. Pharmacopoeias with special reference to Indian, British, United States, International and Extra Pharmacopoeias and various systems of medicines.
3. Routes of administration and classification of pharmaceutical dosage forms.
4. Definition, general formulation, manufacturing procedures and official products of following categories: Aromatic waters, solutions, syrups, spirits, elixirs, linctuses, lotions, liniments, glycerites, gargles, mouth washes, inhalations, milk and magmas, mucilages, jellies, infusion, decoctions, tinctures and extracts.
5. Methods employed in the preparation of plant extracts.
6. Coarse dispersion: Suspension, interfacial properties of suspended particles, theory of sedimentation, effect of Brownian movement, sedimentation of flocculated particles, sedimentation parameters, formulation of suspensions, wetting of particles, controlled flocculation, flocculation in structured vehicles, rheologic considerations, methods of preparation, physical stability of suspensions.
7. Emulsions: Types of emulsion, theories of emulsification (monomolecular adsorption multimolecular adsorption and film formation and solid-particle adsorption), physical stability of emulsions, creaming and Stoke's law, coalescence and breaking, phase inversion, evaluation of emulsion and pharmaceutical applications.

PHARMACEUTICAL CHEMISTRY-I (ORGANIC-I)

1. Fundamentals of organic reaction mechanism: Classification of organic reactions, bond breaking and bond-making processes, concerted and stepwise reactions, reactivity and orientation, electrophiles and nucleophiles, aromatic, role of solvent, polarity of solvent.
2. Reaction intermediates: Transition states, rearrangement, carbanions, carbocations, carbon radicals, carbenes, nitriles and benzyne.
3. Stereochemistry: Stereoisomerism, enantiomers, elements of symmetry, chirality, racemic modification, configuration, specification of configuration, sequence rule, conformational isomers, reactions involving stereoisomer's, asymmetric synthesis.
4. Study of reaction mechanism, reactivity and orientation, effect of substituent groups of following categories of reactions:

4.1. Addition reactions: (a) Nucleophilic addition reactions: Nucleophilic addition to C=O, addition of cyanides, derivatives of ammonia, alcohols, Grignard's reagent, Aldol condensation, nucleophilic addition to C=C, C≡C. (b) Electrophilic addition reactions: Addition of hydrogen, halogen, hydrogen halide, sulphuric acid, water, halohydrin formation, dimerisation, alkanes, oxymercurationdemercuration, hydroboration-oxidation, stereoselective and stereospecific reactions, comparison of nucleophilic and electrophilic addition in alpha-beta unsaturated carbonyl compounds. (c) Free radical addition reactions: Peroxide initiated addition of HBr (antimarkonikov orientation).

4.2. Elimination reactions: 1, 2 Elimination reactions, dehydrohalogenation of alkyl halides, E1, E2, E1cb, E1 vs E2, elimination vs substitution.

4.3. Substitution reactions: (a) Free radical substitution: Halogenation of alkanes (b) Nucleophilic Aliphatic: SN1, SN2, SN1 vs SN2, neighboring group effect (c) Nucleophilic Acyl substitution: Esterification reactions, conversion to acids, acid chlorides, amides, esters, nucleophilic substitution alkyl vs acyl. (d) Electrophilic aromatic substitution: Nitration, sulphonation, halogenation, Friedal Craft's alkylation, electrophilic substitution in naphthalene. (e) Nucleophilic aromatic substitution: Bimolecular displacement, benzyne, and aliphaticvs aromatic substitution.

4.4. Condensation and rearrangement reactions: Claisen condensation, Reimer Tieman reaction, Hoffmans degradation of amides, Kolbe's reaction, Fries rearrangement, Cannizaro's reaction and coupling reaction.

PHARMACEUTICAL CHEMISTRY-II (INORGANIC)

1. The occurrence of impurities in pharmaceutical preparations: Types of impurities and limit test for chlorides, sulphate, arsenate, lead, heavy metals and iron.

2. A systematic study of the following pharmaceutical inorganic compounds with reference to their preparations, properties, tests for identity and purity, pharmaceutical uses and assay methods as given in Indian Pharmacopeia (IP).

3. Group IA: Sodium and potassium compounds: Sodium benzoate, sodium bicarbonate, sodium borate, sodium chloride, sodium citrate, sodium fluoride, sodium metabisulphate, sodium phosphate, sodium potassium tartarate, potassium permanganate, potassium dichromate, potassium chloride, potassium bromide and potassium iodide. Group-IB: Copper, silver and gold compounds: Copper sulphate, silver nitrate, strong silver proteins, and mild silver proteins.
Group-IIA: Magnesium, calcium and barium compounds: Light and heavy magnesium carbonate, light and heavy magnesium oxide, magnesium hydroxide, magnesium sulphate, magnesium trisilicate, magnesium strearate, calcium gluconate, calcium acetate, calcium carbonate, calcium chloride, calcium lactate, and barium sulphate. Group IIB: Zinc and mercury compounds: Zinc oxide, zinc sulphate, zinc stearate, zinc chloride, mercury, yellow mercuric oxide, mercurous chloride and ammoniated mercury.

4. Group IIIA and IIIB: Boron and aluminium compounds: Boric acid, aluminium hydroxide gel, aluminium magnesium trisilicate and alum. Group IVA and IVB: Bentonite, light and heavy kaolins and kaolin poultice. Group VA and VB: Nitrogen, antimony, and bismuth compounds: Strong and diluted ammonia solutions, strong ammonium acetate solutions, ammonium chloride, sodium antimony gluconate and bismuth subcarbonate.

5. Group VIB: Sulphur, selenium compounds: Sublimated sulphur, precipitated sulphur and selenium sulphide. Group VIIA and VIIB: Hydrogen, oxygen and halogen compounds: Purified water, water for injection, hydrogen peroxide, chlorinated lime, aqueous iodine solution and strong iodine solution. Group VIII: Iron compounds: Ferrous sulphate, ferrous gluconate, ferric ammonium citrate, and iron-dextran inj.

6. A study of major intra and extra cellular electrolytes, essential and trace elements and their physiological role.

7. Selected case studies in medicinal inorganic chemistry from the following topics: a. Biomedical uses of lithium b. Application of platinum compounds in medicine c. Gold (I) compounds as therapeutic agents d. Ruthenium, titanium and gallium compounds in medicine.

8. Metal compounds as contrast agents for MRI and medicinal applications of radio-active compounds.

ADVANCE MATHEMATICS

1. Differential equations and its applications: Revision of integral calculus, definition and formation of differential equations, equations of first order and first degree, variable separable, homogeneous and linear differential equations and equations reducible to such types, linear differential equations of order greater than one with constant coefficients, complementary function and particular integral, simultaneous linear differential equations, pharmaceutical applications.

2. Laplace transforms: Definition, transforms of elementary functions, properties of linearityand shifting, inverse Laplace transforms, transforms of derivatives, solution of ordinary and simultaneous differential equations.

3. Biometrics: Significant digits and rounding of numbers, data collection, random and nonrandom sampling methods, sample size, data organization, diagrammatic representation of data, bar, pie, 2-D and3-D diagrams, measures of central tendency, measures of dispersion, standard deviation and standard error of means, coefficient of variation,confidence (fiducial) limits.

4. Probability: Probability and events, Bayer's theorem, probability theorems, probability distributions, elements of binomial and poison distribution, normal distribution curve and properties.

5. Correlation and regression analysis: Method of least squares, statistical inference, student's and paired t-test, f-test and elements of ANOVA, kurtosis and skewness, applications of statistical concepts in Pharmaceutical Sciences.

PHARMACEUTICS-II (PHYSICAL PHARMACY)

1. Matter: State and selected properties: State of matter, Latent heat and vapour pressure, Sublimation, Critical point, Eutectic point, Solids: Crystalline and amorphous,Polymorphism, Refractive index, Colligative properties, Partition coefficient, Phaseequilibrium and Phase rule.

2. Micromeritics: Particle size and size distribution: Average particle size, Number and weight distribution, Particle number, Methods for determining particle size, Optical microscopy, Sieving, Sedimentation, Particle volume measurement, Particle shape andsurface area, Methods for determining surface area, Derived properties of powders,Porosity, Packing arrangements, Densities of particles, Bulkiness, Flow properties.

3. Surface and Interfacial phenomenon: Liquid interfaces, Surface and interfacial tensions,Surface free energy, Measurement of surface and interfacial tensions, Spreadingcoefficient, Adsorption at liquid interfaces, Surface active agents, HLB, Types ofmonolayer at liquid surfaces, Critical micelle concentration, Adsorption at solid interfaces,Solid-gas and solid-liquid interface, Wetting and detergency, Application of surface activeagents, Electric properties of interfaces.

4. Rheology: Newtonian systems: Newton's law of flow, Kinematics viscosity, Temperature dependence and the theory of viscosity, Non-newtonian systems, Plastic flow,Pseudoplastic, Dilatant flow. Thixotropy: Measurement of thixotropy, Bulges and spurs,Negative thixotropy, Thixotropy in formulation, Determination of Rheologic properties,Choice of viscometer, Capillary viscometer, Falling sphere viscometer, Cup and Bobviscometer, Cone and plate viscometer, Viscoelasticity, Pshycorheology.

5. Dispersed systems: Colloids, Types of colloidal systems, Optical properties of colloids, Kinetic properties of colloids, Electrical properties of colloids, Pharmaceutical applications of colloids.

6. Complexation and protein binding: Classification of complexes, Methods of preparation and analysis, Pharmaceutical applications, Protein binding, Factors affecting complexation and protein binding.

7. Chemical kinetics: General considerations and concepts, Half-life determination, Factors affecting rate of reaction, Order of reaction, Determination of order of reaction.

PHARMACEUTICAL CHEMISTRY-III (ORGANIC-II)

1. Nomenclature of heterocyclic compounds: Trivial names, Systematic (Hantzch-Widman) nomenclature of monocyclic compounds, Naming of fused ring systems (biand tricyclic systems).
2. Classification of heterocyclic compounds: Monocyclic, bicyclic and tricyclic systems
3. Chemistry, preparation, properties and pharmaceutical applications of followingheterocyclic rings:

3.1 Monocyclic rings

3-membered with one hetero atom: Aziridine,

4-membered with one hetero atom: Azetidine

5-membered with one hetero atom: Pyrrole, Thiophene, Furan,

5-membered with two or more hetero atoms: Imidazole, Pyrazole, Oxazole, Isoxazole,Thiazole, Isothiazole , Triazole, Tetrazole Oxadiazole, Thiadiazole. E 6-membered with one hetero atom: Pyridine, Pyran,

6-membered with two or more hetero atoms: Pyrimidine

3.2 Bicyclic rings –

5-membered with one hetero atom: Indol

5-membered with two or more heteroatoms: Benzimidazole, Benzopyrazole.,Benzoxazole, Benzothiazole, Benzofuran

6-membered with one hetero atom: Quinoline, Isoquinoline, Coumarin

6-membered with two or more hetero atoms: Purine, Quinazoline

3.3 Tricyclic rings: Acridine

4. Pericyclic reactions, Conservation of orbital symmetry, Orbital symmetry rules,Mechanism and stereochemistry of electrocyclic, cycloaddition and sigmatropic reactions
5. Applications of reagents used in organic syntheses: Aluminium chloride, Boron trifluoride, Grignard reagent, Phosphorus pentachloride, Thionyl chloride, n-Bromosuccinimide, Raney nickel, Platinum, Palladium, Lead tetra acetate, Osmium tetraoxide, Aluminium t-butoxide, Jones reagent, Lithium aluminium hydride, Sodium borohydride, Stannous chloride, Aluminium isopropoxide, Diazomethane, Dicyclohexyl crabodimide, Ozone, Polyphosphoric acid, Sodamide, Sodium azide, Sodium hydride.
6. Oxidation and hydrogenation/reduction: Types of oxidative reactions and oxidizing reagents, Homogenous and heterogeneous hydrogenation.
7. Chemistry of biomacromolecules:A Carbohydrates: Introduction, classification, Nomenclature, Properties of carbohydrates,monosaccharides, Configuration of monosaccharides, Cyclic structure of glucose,Anomers, epimers and mutarotation, Furanose and pyranose forms of glucose,Disaccharides: sucrose, lactose, maltose, polysaccharides: cellulose, starch, glycogen,conversion of aldose to ketose, methods for lengthening and shortening the chain,characterization tests for identification of carbohydrates.B Lipids: Introduction, Classification, Reaction of fatty acids, Identification,Characterization of lipids, Membrane lipidsC Proteins and Amino acids: General properties of amino acid, Synthesis of amino acid,Reaction of amino acid (due to -NH2 group, -COOH group and due to both), Synthesis and properties of peptides, End group analysis, N and C terminal amino acid determination, Sequence analysis, Primary, Secondary, Tertiary and Quaternary structure.

PHARMACEUTICAL MICROBIOLOGY

1. Introduction and scope of microbiology.
2. Classification of microbes and their taxonomy: Bacteria, Actinomycetes, Rickettsiae, Spirochetes and Viruses. Microbial genetics and variation.
3. Identification and cultivation of microbes: Stains and types of staining techniques, Electron microscopy. Nutrition, cultivation, isolation of bacteria, actinomycetes, fungi, and viruses.
4. Control of microbes by physical and chemical methods:Disinfections, Factors influencing disinfectants, Dynamics of disinfectant,Disinfectants and antiseptic and their evaluation.Sterilization: Methods and equipments.Sterility testing of Pharmaceutical products.
5. Immunity, primary and secondary defensive mechanisms of body, microbial resistance, interferon.
6. Food spoilage and preservation of food.
7. Microbial assay of antibiotics, vitamins and amino acids.

ANATOMY PHYSIOLOGY & HEALTH EDUCATION-I

1. Scope of anatomy & physiology and basic terminology used in the subject.
2. Structure of Human Cell, its components and their functions. Causes of cellular injury, Pathogenesis, Morphology of cell injury, Adaptations and cell death.
3. Elementary Tissues of the Human Body: Epithelial, Connective, Muscular and nervous tissues their sub-types and characteristics.
4. Osseous System: Structure, composition and functions of skeleton, classification of joints and types of movements of joints. 5. Skeletal Muscles: Gross anatomy of muscles, physiology of muscle contraction,physiological properties of skeletal muscles.
5. Haemopoietic System: Composition and functions of blood and its elements, blood groups and their significance, mechanism and significance of blood coagulation.
6. Lymph and Lymphatic System: Composition, formation and circulation of lymph. Basic physiology and functions of spleen.
7. Cardiovascular System: Basic anatomy and physiology of the heart, blood vesselsand circulation, basic understanding of cardiac cycle, heart sounds andelectrocardiogram, blood pressure and its regulation.
8. Health Education: Concepts of health and disease, causative agents & prevention of disease.

a. Classification of food requirements, importance of balanced diet and nutritional, deficiency disorders; their treatment and prevention.

b. Demography and family planning: Demography cycle, family planning and various contraceptive methods and medical termination of pregnancy.

c. First aid: Emergency treatment of shock, snakebites, burns, poisoning, fractures and resuscitation methods.

PHARMACEUTICS-III (PHARMACEUTICAL ENGINEERING)

1. Unit Operations: Introduction to unit operations, law of material and energy balances, rate of a process, steady and unsteady states, equilibrium state, dimensionless equations, dimensionless formulae, dimensionless groups.
2. Material of Construction: Types of material of construction, factors affecting selection of material of construction, general study of composition, corrosion resistance, properties and applications of the materials of construction with special reference to stainless steel, plastic and glass.
3. Size Reduction: Definition, objectives of size reduction, factors affecting size reduction, mechanisms of size reduction, laws governing energy and power requirements of a mill,ball mill, hammer mill, fluid energy mill and other mills in pharmaceutical industry, wet grinding, selection of size reduction method, selection of degree of size reduction.
4. Size Separation: Standards for powders, standards for sieves, sieving methods, fluid classification methods.

5. Mixing: Theory of mixing, types of mixtures, solid-solid, solid-liquid and liquid-liquidmixing and mixing equipments.
6. Filtration: Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter, meta filter, membrane filter, factors affecting filtration, optimum cleaning cycle in batch filters.
7. Centrifugation: Principles of centrifugation, industrial centrifugal filters, and centrifugal sedimenters.
8. Crystallization: Characteristics of crystals like-purity, size, shape, geometry, habit, forms size and factors affecting them, solubility curves and calculation of yields, supersaturation theory and its limitations, nucleation mechanisms, crystal growth, study of various types of crystallizer, tanks, agitated batch, Swenson Walker, single vacuum,circulating magma and crystal crystallizer, caking of crystals and its prevention.
9. Refrigeration, Air Conditioning and Humidity Control: Principles and applications of refrigeration and air conditioning, basic concepts and definition of humidity, wet bulb and adiabatic saturation temperatures, psychrometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipments for humidification and dehumidification operations.
10. Evaporation: Basic concept of phase equilibrium, factor affecting evaporation, different types of evaporators, single and multiple effect evaporators, evaporation under reduced pressure.
11. Distillation: Raoult's law, phase diagrams, volatility, simple steam and flash distillations, rectification, Mc. Cabe Thiele method for calculations of number of theoretical plates, azeotropic and extractive distillation.
12. Drying: Moisture content and mechanism of drying, rate of drying, classification and types of dryers, dryers used in pharmaceutical industries, special drying methods.
13. Corrosion: Types of corrosion, methods of reducing corrosion.

PHARMACEUTICS I
(DISPENSING, COMMUNITY AND HOSPITAL PHARMACY)
1. Prescription: Parts, types and handling of prescription, knowledge of commonly user Latin terms in prescriptions, general dispensing and compounding procedures, labeling of dispensed products, sources of errors in prescription, care required in dispensing of prescription.
2. Pharmaceutical calculations: Different systems of weights and measures, dilution and concentration of solutions, percentage solutions, calculation by allegation, proof spirits, isotonic solution, calculation for adjustment to isotonicity, posology, knowledge of prophylactic and therapeutic doses of commonly used drugs, detection of overdoses in prescription, calculation of doses for infants, adults and elderly patients.
3. Principle involved and procedures adopted in dispensing of mixtures, solutions,emulsions, lotions, liniments, powders, capsules, tablets, tablet triturates, pastilles,lozenges, pills, ointments, creams, pastes, suppositories, jellies, inhalations, paints, sprays and ophthalmic preparations.
4. Incompatibility: Physical, therapeutic and chemical incompatibilities, incompatibility of common occurrence and their correction.
5. Community pharmacy: Organization and structure of retail and whole sale drug store and design, legal requirements for establishment and maintenance of drug stores, dispensing of proprietary products, maintenance of records, patient counseling on rational use of drugs and aspects of health care.
6. Hospital pharmacy: Organization of a hospital pharmacy, responsibilities of a hospital pharmacist, pharmacy and therapeutic committee, hospital formulary, contents, preparation and revision of hospital formulary, inventory control procedures in hospital pharmacy.

PHARMACEUTICAL ANALYSIS-I
1. Theoretical aspects of quantitative analysis: Significance of quantitative analysis in quality control, different techniques of analysis, statistical treatment of analytical data, types of errors, mean deviation, standard deviation, accuracy and precision, significant figures, rules for retaining significant figures, methods of expressing concentration, primary and secondary standards.
2. Titrimetric techniques: Theoretical considerations and pharmaceutical applications with special

reference to Indian Pharmacopoeia of the following analytical techniques: Acid-Base titrations: Acid base concepts, role of solvents, relative strengths of acids and bases, ionization, law of mass action, common-ion effect, ionic product of water, pH, hydrolysis of salts, Handerson-Hesselbach equation, buffer solutions, neutralization curves, acid-base indicators, theory of indicators, choice of indicators, mixed indicators, universal indicators, polyprotic systems, preparation and standardization of neutralization titrants.

Oxidation-Reduction titrations: Concepts of oxidation and reduction, redox reactions, strengths and equivalent weights of oxidizing and reducing agents, theory of redox titrations, redox indicators, oxidation-reduction titration curves, titrations involving potassium permanganate, cerric ammonium sulphate, potassium iodate, potassium bromate, iodometry and iodimetry, pharmaceutical applications, preparation and standardization of redox titrants like potassium permanganate, cerric ammonium sulphate, potassium dichromate, potassium iodate, potassium bromate, iodine, sodium thiosulphate.

Precipitation titrations: Precipitation reactions, solubility products, detection of endpoint in precipitation titrations, indicators used in precipitation titrations, preparation and standardization of titrants like silver nitrate, ammonium and potassium thiocyanate,titrations according to Mohr's and Volhard's methods, ammonium and potassiumthiocyanate, applications in pharmaceutical analysis.

Gravimetric analysis: Fundamentals of gravimetry, precipitation reagents, precipitation techniques, specific examples of gravimetric estimation like aluminium as hydroxyquinolate, barium as barium sulphate, lead as chromate and magnesium as magnesium pyrophosphate.

Non-aqueous titrations: Scopes and limitations, solvents used in non-aqueous titrations,acid-base equilibria in non-aqueous media, differentiating and leveling effect of solvents,preparation and standardization of perchloric acid and tetrabutyl ammonium hydroxide,titration of weak acid and weak bases with suitable examples.F

Complexometric titrations: Theory of complexometric analysis, factors influencingstability of complexes, metal ion indicators, types of disodium edetate titrations withsuitable examples, preparation and standardization of disodium edetate, methods to increase the selectivity of EDTA titrations.

PHARMACOGNOSY-I

1. Definition, history, scope and development of pharmacognosy, sources of crude drugsand methods of their classification.
2. Plant hormones and their applications, influence of mutation and hybridization withreference to medicinal plants.
3. Pest control and natural pest control agents.
4. Quality control of crude drugs: Different types of adulteration and their evaluation usingvarious methods like organoleptic, microscopic, physical, chemical and biological.
5. An introduction of various types of primary and secondary metabolites as activeconstituents of crude drugs, general methods of their isolation, classification, propertiesand systematic pharmacognostic study of:

a) Carbohydrates and drugs belonging to this class like: Agar, Guar Gum, Acacia,Isabgol, Pectin, Sterculia, Tragacanth.
b) Lipids and drugs belonging to this like: Castor oil, Beeswax, Cocoa butter, Hydonocarpus oil, Kokum butter, Codliver oil, Woolfat.
c) Resins and Tannins, and drugs of these classes like: Podophyllum, Balsams,Turmeric, Ginger, Ipomea and Myrobalan.
d) Pharmaceutical aids like: Talc, Kaolin, Bentonite, Gelatin, Cotton and ViscoseRayon.

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – II

1. Central Nervous System: Functions of different parts of brain and spinal cord.Neurohumoral transmission in the central nervous system, reflex action,electroencephalogram and specialized function of the brain. Cranial nerves and theirfunctions.
2. Autonomous Nervous System: Physiology and functions of the autonomous nervous system. Mechanism of neurohumoral transmission in the automatic nervous system.
3. Respiratory System: Anatomy of respiratory organs, functions of respiratory organs,mechanism and regulation of respiration, respiratory volumes and vital capacity.
4. Endocrine System: Basic anatomy and physiology of pituitary, thyroid, parathyroid,adrenals, pancreas, testis and ovary; their hormones and functions.
5. Digestive System: Gross anatomy of gastrointestinal tract, functions of its different parts,various gastrointestinal secretions and their role in the absorption and digestion of food.
6. Reproductive System: Anatomy of male & female reproductive system and theirhormones, physiology of menstruation, coitus, infertilization, sex differentiation,spermatogenesis and oogenesis, pregnancy its maintenance and parturition.
7. Urinary System: Various parts, structures and functions of kidney and urinary tract,physiology of urine formation and acid-base balance.
8. Sense Organs: Basic anatomy and physiology of the eye (vision), ear (hearing), tastebuds, nose (smell) and skin (superficial receptors).

PHARMACEUTICS -V (DOSAGE FORM DESIGN)

1. Preformulation studies: Study of physical properties of drug like physical form, particlesize, shape, density, wetting, dielectric constant, solubility, dissolution and organolepticproperty and their effect on formulation, stability and bioavailability.Study of chemical properties of drugs like hydrolysis, oxidation, reduction, racemization,polymerization etc. and their influence on formulation and stability of products. Biopharmaceutical consideration in the formulation stages of dosage form development.
2. Study of different types of formulation additives e.g., diluents, binders, disintegrants, lubricants, vehicles, anti-oxidants, preservatives, coloring, flavoring, sweetening,suspending and emulsifying agents. Drug-excipient interactions.
3. Stability studies: Determination of shelf life (expiry date) and overage calculations,stabilization and stability testing protocol for various pharmaceutical products.
4. Polymers: Classification, synthesis, properties, characterization and evaluation ofpolymers including biodegradable polymers, mechanism of biodegradation in body,pharmaceutical applications of polymers.
5. Dissolution technology: Types of various dissolution apparatus as per pharmaceuticalcompendia, dissolution media, factors affecting dissolution, dissolution testing of different types of dosage formulations, data interpretation, similarity and difference factors.
6. Solubilization: Theory of solubilization, factors affecting solubilization, methods of solubility enhancement.

PHARMACEUTICAL ANALYSIS-II

1. Conductometry: Ohm's law and ionic conductivities, instrumentation, conductometrictitration curves, applications of conductometry in acid-base, redox, precipitation andcomplexometric titrations with suitable examples.
2. Potentiometry: Theory and principles, reference electrodes, indicator electrodes,instrumentation for potentiometric titrations, location of end point in potentiometry,application of potentiometry in acid-base, redox, precipitation and complexometrictitrations with suitable examples.
3. Polarography: Principle, polarographic wave, Illkovic equation and factors affecting it,dropping mercury electrode, instrumentation, polarographic methods of analysis,pharmaceutical applications.
4. Amperometry: Principle, amperometric titration curves, applications.
5. Coulometry: Principle, apparatus, pharmaceutical applications.
6. Radioimmunoassay: Principle, procedure, pharmaceutical applications.

7. Thermal methods of analysis: Principle, instrumentation, pharmaceutical applications of differential scanning calorimetry, thermogravimetric analysis and differential thermal analysis.
8. X-ray diffraction: Principle, Bragg's Law, instrumentation, pharmaceutical applications.
9. Miscellaneous methods of analysis: Karl-Fischer titrations, Diazotization titrations, gasometry, Kjeldahl's method of nitrogen estimation and oxygen flask combustion.

PHARMACEUTICAL CHEMISTRY- IV (BIOCHEMISTRY)

1. Enzymes: Nomenclature and classification, structure of enzymes, mechanism of enzyme action, mode of enzyme action, factors affecting enzyme action, enzymeinhibition, regulation of enzyme activity, allosteric enzymes and pharmaceuticalapplication.
2. Co-enzymes: Metals and vitamins as coenzymes and their significance.
3. Carbohydrates metabolism: Glycolysis, gluconeogenesis and glycogenolysis, citricacid cycle, pentosephosphate, pathway, uronic acid pathway, metabolism of galactoseand galactosemia.
4. Lipid metabolism: Transportation and absorption of fats, role of liver in fatmetabolism, oxidation of fatty acids, ketosis, biosynthesis of saturated and unsaturatedfatty acids, control of lipid metabolism, essential fatty acids and eicosanoids,metabolism of cholesterol.
5. Biological oxidation: Redox potential, enzymes and co-enzymes involved in oxidationreduction and its control, the respiratory chain, its role in energy capture and itscontrol, energetic of oxidative phosphorylation, inhibitors of respiratory chain andoxidative phosphyrlation, mechanism of oxidative phosphorylation.
6. Metabolism of ammonia and nitrogen containing monomers: Nitrogen balance, biosynthesis of amino acids, catabolism of amino acids, conversion of amino acids tospecialized products, assimilation of ammonia, urea cycle, metabolic disorders of urea cycle, metabolism of sulfur containing amino acids, porphyrin biosynthesis, formation of bile pigment, hyperbilirubinemia, purine biosynthesis, purine nucleotide interconversion, pyrimidine biosynthesis, and formation of deoxyribonucleotides.
7. Genetic code and protein synthesis: Genetic code, components of protein synthesis and inhibition synthesis.

PHARMACOGNOSY II

1. Classification, cultivation, collection, commercial varieties, chemical constituents,substitutes, diagnostic macroscopic and microscopic features and specific chemical testsof following groups of drugs containing glycosides:
a. Saponins - Liquorice, ginseng, dioscorea, and senega.
b. Cardio active sterols- Digitalis, squill, strophanthus and thevetia.
c. Anthraquinone cathartics - Aloe, senna, rhubarb and cascara.
d. Others - Psoralea, ammi majus, ammi visnaga, gentian, saffron, chirata, andquassia.
2. Volatile oils: General method of obtaining volatile oils from plants, study of followingvolatile oil containing drugs as mentha, coriander, cinnamon, cassia, lemon grass,citronella, caraway, dill, clove, fennel, nutmeg, eucalyptus, chenopodium, cardamom,musk, palmrosa, gultheria and sandal wood.
3. Plant bitters and sweeteners.
4. Studies of following drugs: Amla, Shatavari, Tyllophora, Bhilwa, Bach, Punarnava,Chitrak, Apamarga, Gokhru, Shankhpusphi, Brahmi, Adusa, Arjuna, Ashoka, Methi,Lahsun, Palash, Guggal, Gynmema and Shilajit.
5. Biological sources, preparation, identification tests and uses of the following enzymes:Diastase, Papain, Pepsin, Trypsin and Pancreatin.

PHARMACEUTICAL JURISPRUDENCE & ETHICS

1. Introduction
a) Pharmaceutical Legislations – A brief review.
b) Drugs and pharmaceutical industry with

special reference to India.
c) Code of pharmaceutical ethics – A brief review.

2. An elaborate study of the
following:a) Pharmacy Act 1948.
b) Drugs and Cosmetics Act 1940 and Rules 1945.
c) Medicinal & Toilet
Preparations (excise duties) Act 1955.
d) Narcotic Drugs & Psychotropic Substances Act 1985 & Rules.
e) Drugs Price Control Order 1995.
f) Drug Policy 2002.

3. A brief study of the following with special
reference to the main provisions.
a) Poisons Act 1919.
b) Drugs and Magic Remedies (objectionable advertisements) Act 1954.
c) Medical Termination of Pregnancy Act 1970 & Rules 1975.
d) Prevention of Cruelty to Animals Act 1960.
e) States Shops & Establishments Act & Rules.
f) Insecticides Act 1968.
g) AICTE Act 1987.
h) Factories Act 1948.
i) Minimum Wages Act 1948.
j) Introduction to Intellectual Property Rights and Indian Patent Act 1970 withpatents rules 1972.

4. A brief study of the various marketed pharmaceutical products from the followingcategories: (i) Antibiotics (ii) Vitamins (iii) Antihypertensive (iv) Anti-diabetics (v) NSAIDs

PHARMACEUTICS- VI (COSMETIC TECHNOLOGY)
Fundamental of cosmetic science. Formulation considerations, preparation, packagingand evaluation of the following cosmetic preparation:
1. Face Preparation: Face powder, Compact powder, Talcum powder, Face packs and Masks.
2. Colored make-up preparations: Lipsticks, Rouge, Mascara and Eye-liner.
3. Skin preparation: Skin creams, Vanishing creams, Cold creams, All purpose cream,Cleansing creams, Emollient, Anti-perspirant/ deodorant, Moisturizing and foundationformulation, Bleaching creams, Night and massage creams, Anti-wrinkle preparation,Hand creams, Protective skin tonics, Skin moisturizers, Sun-screen preparation.
4. Shaving preparation: Lather shaving stick, Lather shaving creams, Shaving foams,Shaving gels, Preand after shave lotions.
5. Shampoos: Clear liquid shampoos, Acid-balanced shampoos, Egg shampoos, Anti-dandruff shampoos.
6. Hair Preparations: Hair tonics, Hair conditioners, Hair lotions, Hair sprays, Hairdressings, Hair setting lotions and creams, Hair dyes, bleaches, Hair waiving, Hairstraightners and Hair strengtheners.
7. Dental Preparation: Tooth powders, Tooth pastes, Dentifrice, Cleansers and Mouthwashes.
8. Manicure Preparation: Nail polish, Nail lacquers and Nail bleaches.
9. Herbal Cosmetics: Cosmetics containing Aloe, Babul, Brahmi, Chandan, Cucumber,Haldi, Jatamansi, Khus, Mehandi, Neem, Reetha, Shikakai, Tulsi, Arnica, BhringrajAnd Volatile Oils.
10. Cosmetic for babies: Baby cream, lotion and powders.

PHARMACEUTICS-VII (PHARMACEUTICAL TECHNOLOGY-I)
1. Liquid Dosage Forms: Introduction, types of additives used in formulations, vehicles,stabilizers, preservatives, suspending agents, emulsifying agents, solubilizers, colors,flavors and others,

manufacturing, packaging and evaluation of clear liquids,suspensions and emulsions.

2. Semisolid Dosage Forms: Definition, types and mechanisms of drug penetration. Factors influencing penetration. Semisolid bases and their selection. Generalformulation of semisolids, clear gels, manufacturing procedure, evaluation and packaging.

3. Suppositories: Ideal requirements, bases, manufacturing procedures, packaging andevaluation.

4. Solid Dosage Forms: Tablets: a. Formulation of different types of tablets, granulationtechnology on large scale by various techniques, different types of tablet compression,machinery and the equipments involved, evaluation of tablets.b. Coating of tablets: Types of tablet coating, film forming materials, formulation ofcoating solutions, equipments of coating, coating process, evaluation of coated tablets.

5. Solid Dosage Forms: Capsules: Advantages and disadvantages of capsules dosage form,material for production of hard gelatin capsules, size of capsules, methods of capsulefilling and sealing, soft gelatin capsule, capsule shell and capsule content, importance ofbase adsorption and minim per gram factors in soft gelatin capsules, quality control,stability studies and testing of capsule dosage form.

6. Pharmaceutical aerosols: Definition, propellants, and general formulation,manufacturing and packaging methods and pharmaceutical applications.

7. A brief introduction of blood products, plasma substitutes and surgical products.

PHARMACEUTICAL CHEMISTRY-V (MEDICINAL CHEMISTRY-I)

1. Introduction and basic principles of Medicinal Chemistry: Historical perspectives ofMedicinal Chemistry, Drug discovery, Physico-chemical, stereochemical (optical andgeometrical) properties and bioisosterism in relation to biological action, receptors anddrug action, theories and drug receptor interactive forces, Enzymes and drug action, Drugmetabolism, Phase I and Phase II reactions Classification, synthesis of selective drugs, Structure activity relationship,pharmacological/biochemical mechanism of action, Therapeutic uses of following category ofagents: (special emphasis should be given to specified drugs)

2. Drugs affecting neurotransmission:
a.Drug acting on cholinergic neurotransmission: Neurochemistry and stereochemistry ofacetylcholine, Cholinergic, anti-cholinergic, anti-cholinesterase agents andneuromuscular blocking agents (Acetylcholine chloride, Carbachol chloride, Atropine,
Pyridostigmine bromide, Succinyl choline chloride and Tropicamide).
b. Drug acting on adrenergic
neurotransmission: Neurochemistry and stereochemistry ofNorepinephrine, Adrenergic agents, Sympathomimetic agents, Adrenergic receptorantagonists (Ephedrine, Epinephrine, Isoprenaline, Phenylpropanolamine hydrochlorideand Propanolol).
c. Drug acting on seratonergic neurotransmission:
Neurochemistry and stereochemistry of Serotonin, Seratonergic agonists and antagonistic agents.
d. Local Anesthetic agents: Benzocaine, Procaine hydrochloride, Lignocaine hydrochloride, Bupivacaine hydrochloride, and Dibucaine hydrochloride.

3.Drugs affecting the Immune System:
Non-steroidal anti-inflammatory agents, analgesics and anti-pyretic: Chemistry ofinflammatory mediators, Prostaglandins, Leukotrienes and Thromboxanes (Asprin,Acetaminophen, Indomethacin,

Ibuprofen, Naproxen, Piroxicam, Phenylbutazone,Oxyphenbutazone and Celecoxib).Antihistamines, antiallergic and anti-ulcer agents: Neurochemistry and stereochemistryof histamine, Dual acting antihistaminics, H2 and H3 antagonists (DiphenhydramineHydrochloride, Bromodiphenhydramine Hydrochloride, Chlorcyclizine Hydrochloride,Promethazine Hydrochloride, Phenindamine Tartrate and Chlorpheniramine Maleate).

4. Drugs affecting the Respiratory System: Anti-asthmatics, Expectorants and Anti-tussive agents (Salbutamol, Terbutaline, Acetylcysteine, Bromhexine Hydrochloride, Guaifensin and Levopropoxyphene Napsylate).

5.Miscellaneous agents:a. Diagnostic and Medicinal dyes (Congo Red, Evans Blue, Erythrosine Sodium, Iodipamide Meglumine, Phenolsulphonphthalein, Indocyanin Green And FluoresceinSodium).b. Pharmaceutical aids.

PHARMACOGNOSY III

1. Systematic study of source, cultivation, collection, processing, commercial varieties,chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic andmicroscopic features and specific chemical tests of followingAlkaloid containing drugs:
a. Tropane: Belladona, hyoscyamus, datura, coca and withania.
b. Quinoline and isoquinoline: Cinchona, ipecac and opium.
c. Indole: Ergot, rauwolfia, catharanthus, nux-vomica, physosüigma.
d. Steroidal: Veratrum and kurchi.
e. Steroidal amine: Ephedra and colchicum.
f. Purines: Coffee, tea and cola.
2. A brief account of plant-based industries and institutions involved in work on medicinaland aromatic plants in India, utilization and production of phytoconstituents such asQuinine, Calcium sennosides, Podophyllotoxin, Diosgenin, Solasodine and TropaneAlkaloids.
3. Utilization of aromatic plants and derived products with special reference to Sandalwood oil, Mentha oil, Lemon grass oil, Vetiver oil, Gentium oil and Eucalyptusoil.
4. Marine pharmacognosy novel medicinal agents from marine sources.
5. Introduction, classification and study of different chromatographic methods and their applications in evaluation of herbal drugs.
6. Holistic concept of drug administration in traditional systems of medicine, introductionsto ayurvedic preparations like arishtas, asavs, gutikas, tailas, churans, lehyas andbhasmas.

PHARMACOLOGY-I

1. General Pharmacology
a. Introduction to pharmacology, sources of drugs, dosage forms and routes ofadministration, mechanism of action, combined effects of drugs, factorsmodifying drug action, tolerance and dependence, pharmacogenetics.
b. Absorption, distribution, metabolism and excretion of drugs, principle of basicand clinical pharmacokinetics adverse drug reactions and treatment of poisoning,ADME drug interactions, receptors, bioassay of drugs and biologicalstandardization, discovery and development of new drugs. Introduction to clinicaltrials, bioavailability and bioequivalence studies.2. Pharmacology of peripheral nervous system
a. Neurohumoral transmission (autonomous and somatic)b. Parasympathomimetic, parasympatholytic and sympathomimetics.c. Adrenergic receptors and neuron blocking agents, ganglionic stimulants.
and blocking agents.
d. Neuromuscular blocking agents.e. Local anaesthetic agents.
3. Pharmacology of drugs acting on gastrointestinal tract
a. Antacids, anti-secretory and anti-ulcer drugs (pathophysiology of ulcer).
b. Laxatives and anti-diarrhoeal drugs.

c. Appetite stimulants and suppressants.
d. Emetics and anti-emetics.
e. Carminatives, demulcents, protectives, adsorbents, astringents, digestants,enzymes and mucolytics.
4. Autacoids:
a. Histamine, bradykinin, 5- HT and their antagonists.
b. Prostaglandins, leukotrienes and platelet activating factors.
c. Pentagastrin, cholecystokinin, angiotensin, bradykinin and substace P

5. Analgesic, antipyretic, anti-inflammatory (vascular and cellular events of acute inflammation, chemical mediators of inflammation, pathogenesis of chronic inflammation), anti-gout and anti rheumatic drugs (pathophysiology of gout and rheumatoid arthritis)

6. Pharmacology of drugs used for respiratory system: Anti-asthmatic drugs (pathophysiology of asthma) including bronchodilators, antitussives, expectorants and respiratory stimulants.

PHARMACEUTICS -VIII (PHARMACEUTICAL TECHNOLOGY-II)
1. Microencapsulation: Types of microcapsules, importance of microencapsulation in pharmacy, microencapsulation by phase separation, co-accervation, multiorifice centrifugal, spray drying, spray congealing, polymerization complex emulsion, air suspension technique, coating pan and other techniques, evaluation of microcapsules.
2. Parenteral products:
a. Preformulation factors, routes of administration, water for injection, pyrogenicity, non-aqueous vehicles, and isotonicity.b. Aseptic techniques: Sources of contamination and methods of prevention, design of aseptic area, laminar flow bench services and maintenance.
c. Formulation details, containers and closures and their selection.
d. Pre-filling treatment, washing of containers and closures, preparation of solution and suspensions, filling and closing of ampoules, vials, infusion fluids, lyophilization and preparation of sterile powders, equipments for large-scale manufacture and evaluation of parenteral products.
3. Design, development, production and evaluation of controlled released formulations.
4. Novel drug delivery systems: Drawbacks and deficiencies of conventional drug delivery systems, introduction to novel drug delivery systems, e.g., transdermal drug delivery patches, ocular inserts and osmotic pumps, introduction of liposomes and prodrugs.
5. Ophthalmic preparations: Requirements, formulation and methods of preparations, containers, and evaluation.

PHARMACEUTICAL BIOTECHNOLOGY
1. Introduction, historical perspective, genomics, proteonomics and other biotechnology related techniques, scope and future of pharmaceutical biotechnology.
2. Enzyme immobilization: Introduction, factor affecting enzyme kinetics, Technique of immobilization of enzymes, immobilization of plant and bacterial cell, study of enzymes such as hyaluronidase, penicilllinase, streptokinase and steptodornase, amylase and protease, therapeutic applications of enzyme immobilization.
3. rDNA technology: Introduction, transformation, conjugation, transduction, protoplast fusion and plasmid mediated gene transfer, gene cloning including enzymes acting on DNA, cloning vectors, insertion of target DNA into vector, transformation and growth of cells, selection of recombinant clones and their applications, techniques of genetic engineering, study of drugs produced by biotechnology such as activase, humulin, humantrope, HB etc.
4. Vaccine technology: Introduction, immunological principles, conventional vaccines, modern vaccine technologies, development of hybridoma for monoclonal antibodies and monoclonal antibody based pharmaceuticals, pharmaceutical considerations of vaccines.
5. Fermentation: Introduction to fermentation, fermenters and types of fermenters, factors affecting design

of fermenter, the fermentation process and its optimization with special reference to ethyl alcohol, riboflavin, cephalosporin and ascorbic acid.
6. Production and downstream processing of biotech products: Introduction, production, downstream processing, issues to consider in production and purification of proteins, formulation of biotech products and its biopharmaceutical considerations, pharmacokinetics and pharmacodynamics of peptide and protein drugs.
7. Plant tissue culture: Introduction, laboratory requirements, cellular totipotency, types of cultures, protoplast fusion and somatic hybridization, transgenic plants and application of transgenic plants, cryopreservation and application of PTC in Pharmacy.

PHARMACEUTICAL CHEMISTRY-VI (MEDICINAL CHEMISTRY-II)
Classification, synthesis of selective drugs, Structure-activity relationship, Pharmacological/Biochemical mechanism of action, Therapeutic uses of following category of agents: (special emphasis should be given to specified drugs)
1. Drugs affecting central nervous system:
General Anesthetics: Thiopental sodium, Ketamine Hydrochloride, Methohexital Sodium, Paraldehyde and Tribromoethanol.Sedatives and Hypnotics: phenobarbital, methylphenobarbital, allobarbital, butobarbitone, amobarbital, hexobarbital, pentobarbital sodium, cyclobarbital. Nitrazepam and Glutethimide. Antiepileptic or anticonvulsant agents: Phenytoin Sodium, Trimethadione, Phensuximide, Ethosuximide, Valproic Acid and Primidone. Opioid Analgesics: Morphine, Diamorphine Hydrochloride, Codeine, Levorphanol Tartrate, Dextromethorphan Hydrobromide, Pentazocine, Pethidine Hydrochloride, Fentanyl Citrate, Methadone Hydrochloride, Nalorphine Hydrochloride, and Naloxone Hydrochloride. Antiparkinsonian agents and Spasmolytic agents: Biperiden Hydrochloride, Trihexyphenidyl Hydrochloride, Benztropine Mesylate, Orphenadrine Citrate, Chlorphenoxamine Hydrochloride and Levodopa. CNS Stimulants: Caffeine, Theobromine, Nikethamide, Etamivan, Pentetrazol, Bemegride, and Methylphenidate. Psychopharmacological Agents: Neuroleptics, antidepressant and anxiolytic agents (Nikethamide, Doxapram Hydrochloride, Dextroamphetamine Sulphate, Pentylenetetrazole, Amitriptyline Hydrochloride, Imipramine Hydrochloride, Doxepin Hydrochloride, Phenyclidine, Tetrahydrocannabinol, Chloropromazine Hydrochloride, Triflupromazine, Thioridazine Hydrochloride, Prochlorperazine Maleate, Trifluoperazine Hydrochloride, Thiothixene, Haloperidol, Droperidol, Resperidone, Chlordiazepoxide, Diazepam, Oxazepam, Lorazepam, Halazepam, Flurazepam and Alprazolam).

2. Drugs affecting Hormonal System:
a. Thyroid hormones and Antithyroid agents: Biosynthesis of thyroid hormones Propythiouracil, Methimazole, Carbimazole and I131.
b. Insulin and Oral Hypoglycaemic agents: Chemistry of Insulin and
its preparations (Chlorpropamide, Tolbutamide, Glimepride, Glipizide, Rosiglitazone, Pioglitazone, Metformin, Phenformin, Acarbose, Miglitol, Repaglinide).
c. Steroidal agents: Steroidal nomenclature,
Stereochemistry, Biosynthesis, Interconversions of androgens, estrogens, progesterones and adrenocorticoids. Androsterone, testosterone, estrone, estriol, estradiol, diethylstilbesterol, progesterone, cortisone, prednisolone and Dexamethasone. Drugs affecting Haematopietic System: Antithrombotic, Thrombolytic and Anticoagulant agents (Warfarin Sodium, Protamine Sulphate, Dicoumarol, Phenindione and Anisindione).

4. Chemistry and physiological importance of water & lipid soluble Vitamins.

PHARMACEUTICS -IX (PACKAGING TECHNOLOGY)
1. Packaging of pharmaceutical dosage form: Introduction, Definition and function, Regulatory requirements, Nature of package evaluation, Types of packaging.

2. Packaging of solid oral dosage form: Scope, Packaging, stability and shelf life of containers and closures, Unit dosage packaging.
3. Packaging of semisolids and topical: Scope, regulatory requirements, containers and closures.
4. Glass packaging materials: Containers and closures, Glass as a packaging material, composition and types.
5. Plastic packaging materials: Containers and closures, introduction, classification of plastic materials.
6. Metal packaging materials: Containers and closures, Introduction, Modern packaging metal, Tinplate and associated materials aluminium.
7. Tamper-resistant packaging: Introduction, Film wrapper, Blister package, Strip package, Bubble pack, foil, pouches, bottle seals and tape seals.
8. Child resistant package.

PHARMACOLOGY-II

1. Pathophysiology of CNS diseases and pharmacology of drugs used to treat them
a. Neurohumoral transmission in CNS: Cholinergic pathways, Dopaminergic pathways, Serotonergic pathways, Noradrenergic pathways.
b. General anesthetics, alcohol and disulfiram.
c. Hypnotics, sedatives, antianxiety agents, and centrally acting muscle relaxants.
d. Psychopharmacological agents: Antipsychotics, Antidepressants, Anti-manics andHallucinogens.
e. Antiepileptic drugs.
f. Narcotic analgesics and antagonists.
g. Drugs used in neurodegenerative diseases: Parkinson's disease and Alzheimer's disease
h. Drug addiction and drug abuse: Alcohol, Nicotine and Cannabis.
i. CNS stimulants.

2. Pathophysiology of diseases of endocrine system and pharmacology of drugs used for their treatment.
a. Hypothalamic and pituitary hormones.
b. Thyroid hormones and anti thyroid drugs.
c. Insulin, oral
hypoglycemic agents and glucagons.
d. Corticosteroids.
e. Androgens, anabolic steroids and drugs for
erectile dysfunction.
f. Estrogens, progestins and oral contraceptives.
g. Oxytocin and drugs acting on the
uterus.
h. Parathormone, calcitonin and vitamin D, ACTH and corticosteroids.

3. Drug acting on Haematopoietic system
a. Haematinics (pathophysiology of anaemia)
b. Anticoagulants
c. Fibrinolytic and antiplatelet drugs
d. Blood and plasma volume expanders.

PHARMACEUTICS-X (BIOPHARMACEUTICS AND PHARMACOKINETICS)

Biopharmaceutics

1. Introduction: Definition and significance of Biopharmaceutics in formulation development.
2. Gastrointestinal absorption of Drugs: Passage of drugs across biological membranes nature of biological membranes, gastrointestinal absorption mechanism.
3. Factor affecting Drug absorption: Physiological factors, dietary factors, physicochemical factors, pH partition hypothesis, and dosage form factors.

4. Methods of studying gastrointestinal absorption: In vitro and in vivo methods.
5. Drug Disposition: Distribution in blood, cellular distribution, plasma protein binding, tissue protein binding.
6. Drug Excretion: Routes of drug excretion, renal excretion of drugs, factors affecting renal excretion, biliary and salivary excretion of drugs.
7. Drug Biotransformation: Pathways of drug metabolism, drug metabolizing, enzymes, and factors affecting drug metabolism, inhibition and stimulation of drug metabolism.

Pharmacokinetics
1. Definition and need of pharmacokinetic and clinical pharmacokinetics.
2. Introduction to pharmacokinetic parameters, biological half-life, volume of distribution, clearance, rate constants for elimination.
3. One compartment model: Single dosing-intravenous injection and oral absorption, determination of pharmacokinetic parameters from plasma and urine data, measurements of Cmax, Tmax, and AUC.
4. Bioavailability and Bioequivalence: Definition and detailed protocol, Significance of Bioavailability and Bioequivalence studies. Regulatory requirements.

PHARMACEUTICAL CHEMISTRY-VII (MEDICINAL CHEMISTRY-III)
1. Drug Design and Development: Relationship of functional groups to pharmacological activity, Prodrug Design, Analog Design, Topliss Tree Approach, Craig's Plot, Quantitative Structure Activity Relationship (QSAR), Hansch Analysis, Free Wilson Analysis, Fujita Ban Approach, Topological QSAR, Introduction to Computer Aided Drug Design, Molecular Mechanics, Quantum Mechanics, De-Novo Design, 3D QSAR Approaches, Ligand based design, Structure based drug design, applications and case study related to QSAR.

2. Modern Medicinal Chemistry: Introduction to Combinatorial Chemistry, High throughput screening, Green Chemistry and Microbial biotransformation. Classification, synthesis of selective drugs, Structureactivity relationship, Pharmacological/Biochemical mechanism of action, Therapeutic uses of following category of agents: (special emphasis should be given to specified drugs).

3. Drugs affecting the Cardiovascular System: a. Anti-anginal and Vasodilators: Amylnitrate, Nitroglycerin, Isosorbide Dinitrate, Verapamil, Diltiazem, Nifedipine, Amlodipine, Digoxin, and Digitoxin. b. Anti-arrhythmic agents: Quinidine Sulphate, Procainamide Hydrochloride, Lidocaine Hydrochloride and Phenytoin Sodium. c. Antihypertensive agents: Captopril, Enalapril, Quinapril Hydrochloride, Losartan, Reserpine, Guanethidine, Clonidine Hydrochloride, Hydralazine Hydrochloride, Sodium Nitroprusside and Minoxidil. d. Antihyperlipidemic agents: Clofibrate, Gemfibrozil, Atorvastatin, Lovastatin, Dextrothyroxine Sodium, Cholestyramine Resin, Niacin and Probucol.

4. Drugs affecting the Urinary System: Diuretics: Chlorothiazide, Hydrochlorothiazide, Cyclothiazide, Cyclopenthiazide, Methylclorthiazide, Trichlormethiazide, Acetazolamide, Methazolamide, Ethozolamide, Furosemide, Ethacrynic Acid and Triamterene.

5. Chemotherapeutic agents:
I. Antibiotics and Antibacterial agents. Sulphonamides: Sulphanilamide, Sulphapyridine, Sulphathiazole, Sulphadiazine, Sulpharmerazine, Sulphadimidine and Dapsone.
Antibiotics: Penicillin V, Cloxacillin Sodium, Cephazolin Sosium, Chloramphenicol, Aminoglycosides (Streptomycin, Neomycin and Kanamycin), Macrocyclics (Erythromycion, Clarithromycin and Roxithromycin), Tetracyclines, Vancomycin, Valinomycin, Polymyxin and Flouroquinolones.
II. Antiparasitic agents: Antiprotozoal and Anthelmentic agents.
III. Antiamoebic agents: Metronidazole, Tinidazole and Diloxanide Furoate.

IV. Antimalarial drugs: Chloroquine Phosphate, Amodiaquine, Pamaquine, Pentaquine Phosphate, Chloroproguanil Hydrochloride, Cycloguanyil Embonate, Pyrimethamine and Trimethoprim.
V. Antifungal agents: Fluconazole, Tolnaftate, Clotrimazole, Miconazole, Ketoconazole, Fluconazole, Amphotericin-B, and Griseofulvin.
VI. Antimycobacterial agents: Pyrazinamide, Rifampin, Ethambutol Hydrochloride, Isoniazid and Ethionamide.
VII. Anticancer agents, Immunosupressants and Immunostimulants : Cyclophosphamide, Chlorambucil, Busalfan, Methotrexate, Azothiopurine, Cytarabine, Fluorouracil, Methotrexate, Dactinomycin, Daunorubicin Hydrochloride, Doxorubicin Hydrochloride, Etoposide, Vinblastin Sulphate, Vincristin Sulphate and Cisplatin.
VIII. Antiviral including anti-HIV agents: Amantadine Hydrochloride, Rimantadine Hydrochloride, Idoxuridine Trifluoride, Acyclovir, Gancyclovir, Zidovudine and Ritonavir.

PHARMACOLOGY-III

1. Pathophysiology of microbial diseases (Tuberculosis, leprosy, fungal diseases, urinary tract infections, sexually transmitted diseases) and pharmacology of drugs used fortheir treatment
a. General principles of Chemotherapy, b. Sulfonamides and cotrimoxazole, c. Antibiotics: Penicillins, Cephalosporins, Aminoglycosides, Chloramphenicol,Macrolides, Tetracyclines, Quinolones, fluoroquinolones and Miscellaneous antibiotics, d. Anti-mycobacterial drugs, e. Anti-viral and anti-HIV drugs, f. Anti-malarial drugs, g. Drugs for amoebiasis and other protozoal infections, h. Anthelmentics
2. Pathophysiology of Cardiovascular diseases (Hypertension, angina, congestive heart failure, atherosclerosis, myocardial infarction) and pharmacology of drugs used for their treatment. a. Cardiac glycosides, b. Antiarrhythmic drugs, c. Antianginal drugs, d. Antihypertensive drugs, e. Antihyperlipidemic
drugs
3. Anti-neoplastic drugs (pathophysiology of cancer), immunostimulants and immunosuppressive agents.
4. Drugs acting on urinary system: Diuretics

PHARMACOLOGY-IV

1. Principles of Clinical Pharmacology: Dose individualization, Clinical pharmacokinetics, influence of disease on pharmacokinetics and pharmacodynamics, Population pharmacokinetics.
2. Drugs used during infancy, neonates, in the elderly persons and their bio-pharmaceutics.
3. Drugs used during pregnancy and drug induced diseases.
4. The principles, mechanism and clinical evaluation of drug interactions.
5. Common clinical laboratory tests and their interpretation.
6. General principles of Clinical toxicology.
7. Therapeutic Drug Monitoring, Concept of Essential Drugs and Rational Drug use.
8. Principles of Toxicology: Definition of poison, general principles of treatment of poisoning with particular reference to barbiturates, opioids, organophosphorous and atropine poisoning, Heavy metals and heavy metal antagonists.

PHARMACEUTICAL INDUSTRIAL MANAGEMENT AND ACCOUNTANCY

1. Concept of Management: Administrative Management (Planning, Organizing, Staffing, Directing and Controlling), Entrepreneurship development, Operative Management (Personnel, Materials, Production, Financial, Marketing, Time/space, Margin/Morale), Principles of Management (Co-Ordination, Communication, Motivation, Decisionmaking, Leadership, Innovation, Creativity, Delegation of Authority/Responsibility, Record Keeping), Identification of Key Points to give maximum thrust for development and perfection.
2. Economics: Principles of economics with special reference to the laws of demand and supply, demand schedule, demand curves, labour welfare, general principles of insurance and inland and foreign trade, procedure of exporting and importing goods.

3. Materials Management: A brief exposure or basic principles of materials management major areas, scope, purchase, stores, inventory control, an evaluation of material management.
4. Production Management: A brief exposure of the different aspects or Production, Management-Visible and Invisible inputs, Methodology of Activities, Performance Evaluation Technique, Process-Flow, Process Know-how, Maintenance Management.
5. Accountancy: Principles of Accountancy, Ledger posting and book entries, preparation of trial balance, columns of a cash book, bank reconciliation statement, rectification of errors, Profits and loss account, balance sheet, purchase, keeping and pricing of stocks, treatment of cheques, bills of exchange, promissory notes and Hundies, documentary bills.

PHARMACEUTICAL ANALYSIS- IV (QUALITY ASSURANCE)

1. Quality assurance: Concept, Scope, quality control, auditm, total quality management.
2. Development of new analytical methods.
3. Validation: Definition, types, validation of manufacturing and analytical equipments, validation of analytical procedures, importance and limitations of validation, organization for validation.
4. Pharmaceutical manufacturing documentation (PMD): Introduction, guidelines for designing and implementation of PMD programs.
5. Documentation: Protocols, forms and maintenance of records in pharmaceutical industries, preparation of documents for new drug approval and export registration to United States, United Kingdom, Europe and Africa.
6. Patent processing and its applications.
7. Requirement of GMP, GLP, ISO 9000, WHO and U.S. F.D.A.
8. In-process quality control tests, IPQC problems in pharmaceutical industries, sources and control of quality variation, total quality management.
9. Sampling plans, sampling and operating characteristics curves, interpretation of analytical data.
10. Regulatory control and regulatory drug analysis.

DRUG DESIGN

1 Drug Discovery, Design and Development: Introduction to drug design and development, stages of drug design and development, finding a lead, optimizing target interactions, optimizing access to target.
2 Quantum Mechanics and Molecular Dynamics: Introduction to quantum mechanics, Postulates of quantum mechanics, electronic structure, AB initio, semi-empirical, density functional and molecular orbital theories. Introduction to molecular mechanisms, Vander Waal interaction, electrostatic interaction, force field and energy minimization. Introduction to Molecular Dynamics, Conformational searching, Systematic search and applications.
3 Ligand Based Drug Design: Introduction to QSAR, lead molecule, linear and nonlinear modeled QSAR equations, statistics used in QSAR, physicochemical parameter and molecular descriptors, Hansch approach, Fujita-Ban approach, Hybrid QSAR, Graph Theory, Topological QSAR, 3D-QSAR, MSA, RSA, CoMFA, CoMSIA, Pharmacophore mapping and applications of QSAR in drug discovery, Case study: Tubulin polymerization inhibitors
4 Structure Based Drug Design: Methods to derive 3D structures, X-ray crystallography and NMR spectroscopy, pharmacophores, molecular docking, De novo design, Free energies and salvation, electrostatic and non-electrostatic contribution to free energies, 3D data base searching and virtual screening, molecular similarity and similarity searching, combinatorial libraries – generation and utility and further applications on the design of new molecule, Case study: Thymidylate synthase inhibitors and HIV protease inhibitors.
5 Comparative Protein Modeling: Modeling by Homology-the alignment, construction of frame work, selecting variable regions, side chain placement and refinement, validation of protein models– Ramchandran plot, threading and AB initio modeling, Case study: p38
kinase.

PHARMACEUTICAL SALES AND MARKETING

1. Introduction to Pharmaceutical Marketing Management
2. Marketing Task: Demand States & Marketing task, Scope of Marketing and Different Markets
3. Concept of Marketing: Definition of marketing, Distinction between marketing & Selling, Core Marketing Concept, Marketing Place, Marketing Space, Target Market, Segmentation of Market, Needs, Wants & Demands, Product offering, value & satisfaction, Relationship net work, Supply chain competition, Marketing environment, marketing mix (4 P Components), Other concept's name under marketing activities.
4. Marketing Opportunities Market Oriented Strategic Planning: SWOT Analysis, Strategic Formulation and Product Planning. Gathering Information and Measuring Demand: MIS, Market Research, Behavioural Research, Marketing Research, Forecasting & Demand Measurement. Analyzing Consumer Markets & Buyer Behavior: Influencing Buyer Behavior, Buying Decision Process, Motivation of Physician towards Brand. Dealing With The Competition - Identifying Competitors, Analyzing Competitors, Strategies, Strength & Weakness, Designing Competitive Strategies.
5. Developing Market Strategies & Marketing Mix, Product Strategy Positioning & Differentiating the Market Offering (Product): Positioning to Promote Product Life Cycle Marketing Strategies. New Market Offering: Which markets to Enter, How to Enter the Market, Product Development, Market Testing. Setting the Product Strategy: Product & Product Mix, Product Line Analysis, Brand Decision, Packaging & Labeling.
6. Managing & Delivering Marketing Programs.

Value Net-Work & Marketing Channels: Channel Functions, Channel Levels, Channel Management, Decisions, Selecting, Training, Motivating & Evaluating Channels Members, Channel Dynamics, Conflicts, Co- Operation & Competitions. Managing Retailing, Wholesaling & Market Logistics: Types of Retailing, Types of Wholesaling. Managing Advertising, Sales Promotion & Public Relations: Advertising Objective, Choosing the Advertising Message, Measuring Effectiveness of Advertisement, Sales Promotion & Purpose, Public Relations. Managing Sales Force: Recruitment & Selecting Representative, Training Sales Representative, Supervising, Norms for Customer Calls, Motivating Sales Representative, Evaluating Sales Representative.

FOOD SCIENCE TECHNOLOGY

1. Food Chemistry: Food quality characteristics, Composition and nutritive value of common foods, structure, properties and metabolic function of food constituents like water, carbohydrates, lipids, proteins, enzymes, vitamins, minerals, pigments, colors and flavoring substances; Undesirable constituents in food, Changes in food constituents during processing and storage.

2. Food Microbiology: Microbial groupings and identification, Nutrient requirements for bacterial culture, Growth and inactivation kinetics, Harmful and beneficial effects of microbes, microbes in food industry, Food spoilage, poisoning and intoxication.

3. Food Process Principles: Basic principles and techniques of food preservation and processing.

4. Food Technology: Technological process for industrial manufacture of selected foods of commercial importance like Jelly, Pickles, Carbonated beverages, Fruit beverages, Bakery and Confectionary products and Dairy products.

5. Food laws and standards: Food additives, Food packaging, Quality control in food industry.

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PGQP25

Entrance Test for the Course(s): M.Sc. (Industrial Chemistry) [CUGUJ], (Chemical Sciences) [CUGUJ], (Chemistry) [CUHAR] [CUJHD] [CUKER] [CUKNK] [CUPUN] [CURAJ] [CUSBR] [CUTND], (Chemistry (Applied Chemistry)) [CUPUN], (Chemistry (Theoretical and Computational Chemistry)) [CUPUN], (Chemical Sciences (Medicinal Chemistry)) [CUPUN], M.Sc. B.Ed. (Chemistry) [CURAJ], PG Diploma (Chemical Lab Technician) [CUTND]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

INORGANIC CHEMISTRY

I. Atomic Structure:
Evidence for the electrical nature of matter; discharge tube experiments; Thomson's atomic model; Rutherford model; Bohr's model of hydrogen atom; probability picture of electron; quantum numbers; Shapes of s, p, d, orbitals; Aufbau and Pauli exclusion principles, Hund's rule of maximum multiplicity; Electronic configurations of the elements; effective nuclear charge.

II. Chemical Bonding:
Covalent bond – Valence Bond Theory (VBT) and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence Shell Electron Pair Repulsion Theory (VSEPR Theory) to NH_3, H_3O^+, SF_4, ClF_3, ICl_2^- and H_2O. Molecular Orbital Theory, homonuclear and heteronuclear diatomic molecules(CO and NO), multicenter bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

III. Periodic Properties:
Atomic and ionic radii, ionization energy, electron affinity and electronegativity, definition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour.

IV. Acids, Bases and Non Aqueous Solvents:
Arrhenius Concept and Bronsted Theory. The Lux–Flood Solvent Systems. Lewis Concept of Acids and Bases.Physical Properties of a solvent. Types of Solvents and their general Characteristics. Reactions in non aqueous solvents with respect to liquid NH_3 and liquid SO_2.

V. s – block elements:
Comparative study including diagonal relationship of groups, salient features of Hydrides, solvation and complexation tendencies including their function in biosystems. An introduction to alkyls and aryls.

VI. p - block elements (A):
Comparative study including diagonal relationship of groups 13 and 14. Group 13-Hydrides of Boron, diborane, and higher boranes, borazine, borohydrides. Group 14-Fullerenes, carbides, fluorocarbons, silicates (structural principle).

VII. p - block elements (B):

Comparative study including diagonal relationship of groups 15, 16 and 17. group 15- phosphazenes, group 16—tetra sulfur tetranitride, group 17—basic properties of halogens, interhalogens and polyhalides.

VIII. Chemistry of Noble Gases:
Chemical properties of Noble Gases, Chemistry of Xenon, structure and bonding in Xenon compounds.

IX. Chemistry of the Elements of the First Transition Series:
Characteristic properties of the d-Block elements. Properties of the elements of the first transition series, their binary compounds, and complexes illustrating relative stability of their oxidation states, co-ordination number and geometry.

X. Coordination compounds:
Werner's co-ordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of co-ordination compounds. Isomerism in co-ordination compounds, valence bond theory of transition metal complexes

XI. Oxidation and Reduction:
Use of redox potential data-analysis of redox cycle, redox stability in water –frost, Latimer and pourbaix diagrams. Principles involved in the extraction of the elements.

XII. Chemistry of the Lanthanide Elements:
Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

XIII. Chemistry of the elements of the second and third transition series:
General characteristics, comparative treatment with their 3d analogues in respect of Ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

XIV. Chemistry of Actinides:
General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, similarities between later actinides and later lanthanides.

XV. Ionic Solids:
Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, salvation energy and solubility of ionic solids, polarizing power and polarizability of ions, Fajan's rule, metallic bond - free electron, valence bond and band theories.

XVI. Metal-Ligand Bonding in Transition Metal Complexes:
Limitations of Valence bond theory, Crystal field theory (CFT) splitting of d- orbitals in octahedral, tetrahedral and square planar complexes. Crystal Field Stabilization Energy (CFSE), Factors affecting 10 Dq, Spectrochemical series, Effect of crystal field splitting on properties of Octahedral complexes: Magnetic, Spectral.

XVII. Bio-inorganic Chemistry:
Overview, essential and trace elements in biological processes, Metalloporphyrins with special reference to haemoglobin and myoglobin. The role of Model systems, The alkali and alkaline earth metals, Metalloenzymes, Nitrogen fixation cycle.

XVIII. Inorganic solid state chemistry:
Introduction, Preparation of Nonmolecular solids, Band gaps, Metals, Insulators and Semi-conductors. Defects in Solids, Point defects: Schottky and Frenkel, Color center, extended defects. Nonstoichiometry.

XIX. Organometallic Chemistry:
(A) Definition, nomenclature and classification of organometallic compounds, EAN rule, 18 electron rule. General methods of preparations and properties. Structure and bonding in mononuclear metal carbonyls: $Ni(CO)_4$, $Fe(CO)_5$ and $Cr(CO)_6$
(B) Polynuclear metal carbonyl: preparation and structures of $Mn_2(CO)_{10}$, $Fe_2(CO)_9$ and $Fe_3(CO)_{12}$ (Orbital diagram not expected)
(C) Sandwich compounds like Ferrocene: preparation, properties, reactions, structure and bonding.
(D) Preparation and properties of alkyl and aryls of Li, Al, Hg and Ti.

XX. Electronic spectra of Transition Metal Complexes:
Introduction, Types of electronic transitions: The d-d transitions, Charge transfer transitions and Ligand-ligand transitions, Selection rules (Laporte Orbital and Spin), Applications (Ligand field strength, Colour of complexes, cis-trans isomerism and geometry of complexes).

XXI. Industrial fuels and chemicals:
A) Industrial fuels like coal gas, producer gas and water gas.
B) Physico chemical principles involved in the manufacture of HNO_3 (Ostwald's method) and NH_3 (Haber's method).

XXII. Symmetry and Term symbols:
Symmetry elements: Centre of symmetry, Rotation axis, Mirror plane, rotation – reflection axis, Identity (Transdichloroethylene, H_2O and BCl_3).

XXIII. Magnetic properties of transition metal complexes:
Types of magnetic behaviour, Methods of determining magnetic susceptibility (Gouy's method), spin only formula, application of magnetic moment data for 3d – metal complexes.

XXIV. Selected topics:
A) Nanochemistry: Introduction to nano particles, their properties and applications.
B) Solid acids: Introduction to zeolites, structure and applications.
C) Superconductors: Discovery, critical temperature, Meissner effect, Types: Conventional and High Temperature superconductors.

XXV. Inorganic Polymers:
Definition, Properties, Glass transition temperature, Classification (Condensation, addition and coordination Polymers). Silicones: Preparation, structure & bonding and applications.

XXVI. Thermodynamic and kinetic aspects of metal complexes:
A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of octahedral complexes. Trans effect with respect to square planar complexes.

PHYSICAL CHEMISTRY

I. Mathematical Concepts:

Logarithmic relations, curve sketching, linear graphs and calculations of slopes differentiation of functions,maxima & minima, partial, differentiation & reciprocity relations. Integration of some useful/relevant functions

II. Gaseous State:

Postulates of kinetic theory of gases and deviation from ideal behaviour, Van der Waal's equation of state. Critical phenomena; PV isotherms of real gases, continuity of states , the isotherms of van der Waal's equation, relationship between critical constants and van der Waal's constants, the law of corresponding states, reduced equation of state. Molecular Velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter, liquifacation of gases (based on Joule – Thomson effect).

III. Chemical Kinetics

Rate of reaction, factors influencing the rate of a reaction concentration, temperature, pressure, solvent, light, catalyst Concentration dependence of rates mathematical characteristics of simple chemical reaction. Zero order, first order, second order, pseudo order, half life & mean life. Determination of order of reaction: Differential method Integration method, Method of half life period & Isolation method. Radioactive decay as a first order phenomenon. Theories of Chemical Kinetics. Effect of temperature on the rate of reaction, Arrhenius equation and concept of activation energy. Simple collision theory based on hard sphere model. Transition state theory (equilibrium hypothesis). Expression for the rate constant based on equilibrium constant & thermodynamic aspects.

IV. Thermodynamics:

Thermodynamic terms:System, surrounding, types of systems, intensive & extensive properties. State & path functions & their differentials. Thermodynamic process. Concept of work & heat First law of thermodynamics : statements and definitions of internal energy & enthalpy. Heat capacities at constant volume & pressure & their relationship. Joule's law, Joule-Thomson coefficient & inversion temperature . Calculation of w, q, dU, dH, for the expansion of ideal gases under isothermal & adiabatic conditions for reversible processes. Thermochemistry : standard state, standard enthalpy of formation . Hess's law of heat summation & its applications. Heat of reaction at constant pressure & at constant volume . Enthalpy of neutralization, bond dissociation energy & its calculation from thermochemical data. Temperature dependence of enthalpy. Kirchoff's equation.

V. Solutions, Dilute Solutions and Colligative Properties:

Ideal & non ideal solutions, methods of expressing concentrations of solutions, activity & activity coefficients. Dilute solutions, colligatve properties, Roult's law , relative lowering of vapour pressure molecular weight determination. Osmosis: osmotic pressure & its measurement, depression of freezing point, thermodynamic derivation of relation between molecular weight and depression of freezing point. Elevation in boiling point thermodynamic derivation of relation between molecular weight and elevation in boiling point. Experimental methods for determining various colligative properties.

VI. Liquid State and Applications:

Intermolecular forces, structure of liquids (Qualitative description) Structural differences between solids, liquids and gases. Liquid crystal : Difference between liquid crystals ,solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven segment cell. Surface between a liquid and vapour .Surface tension by capillary rise method, stalagmometer method .Viscosity of liquids, Poiseuille equation, use of Ostwald's Viscometer.

VII. Thermodynamics:

Second law of thermodynamics: need for the law, different statements of the law. Carnot cycle and its efficiency, Carnot theorem. Thermodynamic scale of temperature. Concept of entropy :entropy as a state function ,entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, Clausius inequality ,entropy as a criteria of spontaneity and equilibrium .Entropy change in ideal gases and mixing of gases. Third law of thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantages over entropy change. Variation of G and A with P, V & T.

VIII. Chemical Equilibrium:

Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. LeChatelier's principle. Reaction isotherm and reaction isochore – Clapeyron equaltion and Clausius – Clapeyron equation, applications.

IX. Phase Equilibrium:

Statement and meaning of the terms –phase , component and degree of freedom ,derivation of Gibbs phase rule, phase equilibria of one component system –water,CO_2 and S systems. Phase equilibria of two component system – solid –liquid equlibria, simple eutectic –Bi-Cd, Pb-Ag systems, desilverisation of lead. Solid solutions–compound formation with congruent melting point (Mg-Zn) and incongruent melting point, (NaCl-H_2O), ($FeCl_3$-H_2O) and ($CuSO_4$-H_2O) system. Freezing mixtures, acetone – dry ice.
Liquids –liquid mixtures – ideal liquid mixtures, Raoult's and Henry's law. Non –ideal system – azeotropes- HCl-H_2O and ethanol – water systems. Partially miscible liquids –phenol –water, trimethylamine –water, nicotine –water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature. Immiscible liquids, steam distillation. Nernest distribution law – thermodynamic derivation, applications.

X. Electrochemistry:

Electrical transport –conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance measurement of equivalent conductance, variation of equivalent and specific conductance with dilution. Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes , ostwald's dilution law its uses and limitations . Debye–Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method. Applications of conductivity measurements :determination of degree of dissociation, determination of ka of acids , determination of solubility product of a sparingly soluble salt, conductometric titrations.

XI. Solid State:

Defination of space lattice, unit cell. Laws of crystallography –(i) law of constancy of interfacial angels (ii) law of rationality of indices (iii) law of symmetry elements in crystals. X-ray diffraction by crystals. Derivation of Bragg equation. Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method).

XII. Colloidal State:

Definition of colloids, classification of colloids. Solids in liquids (sols): properties –kinetic, optical and electrical; stability of colloids, protective action, Hardy- schulze law gold number. Liquids in liquids (emulsions): types of emulsions, preparation .Emulsifier Liquids in solids (gels): classification, preparation and properties, inhibition, general applications of colloids.

XIII. Quantum Chemistry:

De Broglie hypothesis, the Heisenberg's uncertainty principle, sinusoidal wave equation, Hamiltonian operator, Schrödinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in one dimensional box. Schrödinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave function, radial wave functions, angular wave functions.

XIV. Electrochemistry:

(A) Electrolytic and galvanic cells; reversible and irreversible cells, conventional representation of electrochemical cells; types of reversible electrodes; gas –metal ion, metal-metal ion, metal-insoluble salt anion and redox electrodes, electrode reaction; Nernst equation; derivation of cell E.M.F. and single electrode potential, reference electrodes, standard hydrogen electrode; calomel electrodes; standard electrodes potential, sign convention, electrochemical series and its applications. EMF of a cell and its measurements; Concentration cells (both electrodes and electrolytes) with and without transport; liquid junction potential and its measurement; Application of concentration cell; determination of ionic product of water; transport number of ions; solubility and solubility product. Polarization; elimination of polarization; decomposition potential, measurement of decomposition potential; factor affecting decomposition potential over voltage and types of over voltage; measurement of over voltage ; factor affecting over voltage.

(B) Definition of pH, pOH pKa,and pKb; introduction to potentiometer; determination of pH using hydrogen, quinhydrone and glass electrodes by potentiometric method; Buffer solution, types, buffer action, buffer capacity ,mechanics of buffer action, Henderson-Hazelbulch equation. Corrosion-Types, theories - electrochemical and chemical. Energy sources: Acid and alkaline battery. Ni-Cd cell fuel cells, solar cells. Secondary batteries.

XV. Molecular Structure:

Optical activity and molecular structure; polarization (Mosotti-Clausius equation), orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment; temperature method and refractivity method, dipole moment and structure of molecules.

XVI. Nuclear Chemistry:

Composition of the nucleus. Nuclear binding forces, binding energy, stability, nucleon-nucleon forces and their equality, characteristics and theory of nuclear forces. Nuclear models, the shell model, liquid drop model and its merits. Theory of radioactive disintegration, rate of disintegration half, average life of radio element, units of radioactivity, definition and characteristics of artificial radioactivity. Determination and measurements of radioactivity: Ionisation current measurements; saturation collection; multiplicative ion collection; the Geiger-Muller Counter, characteristics of an ideal Geiger-Muller Counter, proportional counter. methods based on photon collection, Scintillation counter, characteristics of a suitable Scintillator. Nuclear fission, energy released in fission and fission products, neutron emission in fission, nuclear energy, classification of reactors, the breeder reactor, nuclear reactors in India.

XVII. Molecular structure and molecular spectra:

Introduction to electromagnetic radiation; regions of the spectrum; statement of the Born-Oppenheimer approximation; degrees of freedom. Rotational Spectrum: Diatomic molecules, energy level of a rigid rotor (semi-classical principles), selection rules, spectral intensity, distribution using population distribution (Maxewll-Boltzmann distribution); determination of bond length, qualitative description of non-rigid rotor, isotope effect.

XVIII. Photochemistry:

Interaction of radiation with matter, differences between thermal and photochemical processes, laws of photochemistry: Grothus- Drapper law, Stark-Einstein law, Jablonski diagram; depicting various processes occurring in the excited state, quantum yield and its measurements qualitative description of

fluorescence, phosphorescence, non-radiative processes (internal conversion, inter system crossing), photosensitized reactions-energy transfer processes (simple examples).

XIX. Spectroscopy:
Vibrational Spectrum: Infrared spectrum: energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of an- harmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups. Raman spectrum: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules.

ORGANIC CHEMISTRY

I. Structure and Bonding:
Hybridization, C-C bond lengths and bond angles, bond energy, localized and delocalized chemical bonds, Definition and examples of Van der Waals interactions, resonance, hyperconjugation, inductive and field effects, intramolecular and intermolecular hydrogen bonding.

II. Fundamentals of Organic Chemistry:
Curved arrow notation, drawing electron movement with arrows, half and double headed arrows, homolytic and heterolytic bond breaking. Types of reagents – electrophiles and nucleophiles with examples. Types of Organic Reactions: Addition, Elimination, Substitution, Oxidation, Reduction and Rearrangement-one example of each. Energy profile diagrams for exothermic and endothermic reactions, single step and two step reactions. Reactive intermediates – Carbocations, carbanions, free radicals, carbenes, arynes and nitrenes; examples, shape and ways of formation. Assigning formal charges on intermediates and other ionic species. Methods of determination of reaction mechanisms (one example each of product analysis, intermediates, isotope effects, kinetic and stereochemical studies). Theory of acids and bases: Lewis concept; Bronsted and Lowry concept.

III. Alkanes and cycloalkanes:
IUPAC nomenclature of alkanes. General methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction & decarboxylation of carboxylic acids). Physical properties and chemical reactions of alkanes: halogenation, combustion and pyrolysis. Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity with propane as an example. Cycloalkanes – nomenclature, general methods of formation, Baeyer strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring: banana bonds.

IV. Alkenes, dienes and alkynes:
IUPAC nomenclature of alkenes, general methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. The Saytzeff rule, Hoffmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes – Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$. Mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration-oxidation, oxymercuration-reduction. Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes. Industrial applications of ethene and propene. Nomenclature and classification of dienes, isolated, conjugated and cumulated dienes. Structure and stereochemistry of allenes, methods of formation of butadiene, polymerization. Chemical reactions – 1,2- and 1,4-additions, Diels-Alder reaction. Nomenclature, structure and bonding in alkynes. General methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, metal-ammonia reduction and polymerization.

V. Stereochemistry of organic compounds:
Newman and saw horse formulae, Fischer and flying wedge formulae. Concept of isomerism. Types of isomerism. Conformational isomerism – Conformational analysis of ethane and nbutane; conformations of cyclohexane, axial and equatorial bonds, conformation of monosubstituted cyclohexane derivatives. Optical isomerism – elements of symmetry, molecular chirality, definition and examples of enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centers, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization. Specification of configuration at chiral centers: Sequence rules and R:S system of nomenclature. Geometric Isomerism - Determination of configuration of geometric isomers. E and Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds. Difference between configuration and conformation.

VI. Arenes and Aromaticity:
Nomenclature of benzene derivatives. Structure of benzene: molecular formula and Kekule structure. Stability and C–C bond lengths of benzene, resonance structure, MO picture. Aromaticity: The Huckel's rule, aromatic ions, anti-aromaticity. Aromatic electrophilic substitution – general pattern of the mechanism role of σ- and π- complexes. Mechanism of nitration, halogenation, sulphonation and Friedel-Crafts reaction. Activating and deactivating substituents, orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Birch reduction. General methods of formation and chemical reactions of alkyl benzenes – reduction, oxidation, ring and side chain substitution.

VII. Alkyl and aryl halides:
Nomenclature and classes of alkyl halides, general methods of formation, chemical reactions. Mechanism and stereochemistry of nucleophilic substitution reactions of alkyl halides, SN_2 and SN_1 reactions with energy profile diagrams, solvent effect. The addition – elimination (bimolecular displacement) and the elimination – addition (benzyne) mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs. allyl, vinyl and aryl halides.

VIII. Electromagnetic Spectrum: Absorption Spectra:
Ultraviolet (UV) absorption spectroscopy – Absorption laws (Beer-Lambert law), Molar absorptivity, presentation and analysis of UV spectra, Types of electronic transitions, effect of conjugation. Concept of chromophore and auxochromes, Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated dienes and enones, Woodward-Fieser rules for calculation of UV maxima of the above two systems. Numerical problems on above. Infra Red (IR) absorption spectroscopy – Molecular vibrations, Hooke's law, selection rules, Intensity and position of IR bands, measurement of IR spectrum, Finger print region and its use to establish identity, Applications to determine purity, to study progress of chemical reactions and hydrogen bonding. Characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds. Simple problems in structure elucidation using UV and IR spectroscopy.

IX. Alcohols:
Classification and nomenclature. Monohydric alcohols – Methods of preparations by reduction of carbonyl compounds, carboxylic acids, and esters, using Grignard reaction. Hydrogen bonding, acidic nature. Reactions of alcohols – esterification, oxidation and dehydration. Dihydric alcohols – Nomenclature, methods of preparation by hydroxylation of alkenes and acid catalyzed opening of epoxides. Reactions of vicinal glycols – pinacol-pinacolone rearrangement with mechanism.

X. Ethers and Epoxides:
Nomenclature of ethers and methods of preparation by Williamson synthesis, from alcohols by use of diazomethane and by use of H2SO4. Physical properties. Chemical reactions: cleavage with HI. Synthesis of epoxides by reaction of alkenes with peracids and by elimination from vicinal halohydrins. Acid and

base catalyzed ring opening of epoxides, orientation of ring opening, reactions of Grignard and organolithium reagents with epoxides.

XI. Aldehydes and Ketones:
Nomenclature and structure of the carbonyl group. Synthesis of aldehydes by oxidation of alcohols and reduction of acid chlorides, synthesis of ketones by oxidation of alcohols, from nitriles by Grignard reaction and from carboxylic acids. Physical properties. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knovenagel condensations, reaction with ammonia and its derivatives, Wittig reaction and Mannich reaction. Halogenation of enolizable ketones. Mechanisms and one application each of the above reactions.

XII. Phenols:
Nomenclature, structure and bonding. Preparation of phenols by alkali fusion of aromatic sulphonic acids, Dow's process from chlorobenzene and from Cumene through hydroperoxide rearrangement with mechanism. Physical properties and acidic character. Comparative acid strengths of alcohols and phenols, resonance stabilization of the phenoxide ion. Reaction of phenols – Electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gattermann synthesis and Riemer-Tiemann reaction.

XIII. Oxidation and Reduction reactions of carbonyl compounds:
Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction, Meerwein-Pondorf-Verley, Clemmensen, Wolff-Kischner, LiAlH4 and NaBH4 reduction. Mechanisms and one application each of the above reactions

XIV. Carboxylic Acids:
Nomenclature, structure and bonding. Physical properties, acidity and effects of substituents on acid strength. Preparation of carboxylic acids by oxidation of carbonyl compounds, carbonation of Grignard reagent, hydrolysis of cyanides, preparation of aromatic acids by oxidation of alkyl benzenes. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction, synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Dicarboxylic acids: Methods of preparation and effect of heat and dehydrating agents with reference to malonic acid only.

XV. Carboxylic Acids Derivatives
Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides. Physical properties. Methods of preparation from carboxylic acids and interconversion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and acidic and basic hydrolysis of esters with evidences.

XVI. Organic Compounds of Nitrogen
Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid – preparation and properties. Structure and nomenclature of amines, physical properties. Stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amine. Amine salts as phase-transfer catalysts. Preparation of alkyl and aryl amines by reduction of nitro compounds and nitriles, reductive amination of carbonyl compounds, Gabriel phthalimide reaction and Hofmann bromamide reaction.

XVII. Spectroscopy:
Proton Magnetic Resonance (^{1}H NMR) spectroscopy, theory, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, intensity of peaks, interpretation of PMR spectra of simple organic molecules. 13C Magnetic Resonance: Number of signals, splitting of signals – proton coupled and decoupled spectra, off resonance decoupled spectra. ^{13}CMR chemical shifts

– identification of hybridization of carbons and nature of functionalization. Mass Spectrometry: Simple idea of instrumentation, Definitions of parent or molecular ion peak and base peak. Isotope effect with respect to alkyl halides, Fragmentation of ketones – α cleavage and Mc Lafferty rearrangement. Problems pertaining to the structure elucidation of simple organic molecules using spectroscopic techniques (UV, IR, PMR, CMR and MS). Types of problems to be specified. UV and IR to be used as supporting data. Types of CMR and Mass spectroscopy problems to be specified.

XVIII. Alkaloids:
Structure elucidation and synthesis of Nicotine, Atropine and Papaverine.

XIX. Stereochemistry of Reactions:
Mechanism and stereochemistry of (i) Addition of halogens and halogen acids to open chain alkenes. Markownikoff's and anti- Markownikoff's addition. (ii) SN_1, SN_2, SN_i , substitutions and (iii) E_1, E_2 and E_{1cb} elimination reactions.

XX. Heterocyclic Compounds:
Introduction, Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole. Introduction to condensed 5 and 6 membered heterocycles. Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fischer indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

XXI. Vitamins and Hormones:
Vitamins: Importance and classification. Structure elucidation and synthesis of Vitamins A and C. Hormones: Important hormones and their uses. Structure elucidation and synthesis of Thyroxine and Adrenaline.

XXII. Amino acids, Peptides, Proteins and Nucleic Acids:
Classification, structure and stereochemistry of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation and reactions of α-amino acids.Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical methods of peptide synthesis, solid-phase peptide synthesis. Structures of peptides and proteins. Levels of protein structures. Protein denaturation/renaturation. Nucleic acids: Introduction. Hydrolysis of nucleic acids. Ribonucleosides and ribonucleotides. General idea of the double helical structure of DNA glucose. Mechanism of mutarotation. Formation of glycosides, ethers and esters. Structure elucidation of sucrose.

XXIII. Terpenes:
Classification. General methods of structure elucidation. Chemistry and synthesis of citral and its conversion to ionones. Chemistry and synthesis of α-terpineol, camphor. Chemistry of α-pinene. Chemistry of zingiberene.

XXIV. Organic synthesis *via* Enolates:
Acidity of α-hydrogens, Synthesis of ethyl acetoacetate by Claisen condensation, keto-enol tautomerism in ethyl acetoacetate. Alkylation of diethyl malonate and ethyl acetoacetate. Alkylation of 1,3-dithianes. Alkylation and acylation of enamines.

XXV Fats, Oils and Detergents:

Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides. Hydrogenation of unsaturated oils. Saponification value, iodine value and acid value of oils. Soaps, synthetic detergents, alkyl and aryl sulphonates.

XXVI. Synthetic Polymers:

Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Zeigler-Natta polymerization and vinyl polymers. Condensation or step-growth polymerization. Polyesters, polyamides, phenol-formaldehyde resins, urea-formaldehyde resins, epoxy resins and polyurethanes. Natural and synthetic rubbers.

XXVII. Photochemistry:

General idea of photochemical reactions. Electronic transitions and transition states. Jablonskii diagram. Norrish type I and Norrish type II cleavage of ketones.

PGQP26

Entrance Test for the Course(s): M.Sc. (Computer Science and Information Technology) [CUHAR], (Computer Science) [CURAJ], [CUKER], [CUTND], [CUSBR], (Computer Science (Big Data Analytics)) [CURAJ], (Computer Application) [CUKNK]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Basic Mathematics
Set theory: Venn diagram, set operations, mathematical induction, functions and relations Algebra and linear algebra: Theory of equations, complex numbers, matrices and Determinants.

Real and complex analysis: Basics of limit, continuity, differentiation, integration, elementary differential equations, series and sequences and their convergence, Analytic functions, Cauchy-Riemann equations, complex integration, Cauchy's theorem and formula, power series and their convergence, Taylor and Laurent series, beta and gamma functions, Laplace and Fourier transforms.

Combinatorics: Sum and product rules, permutation, combination, recurrence relations, pigeon-hole principle, principle of inclusion and exclusion Probability and statistics: Mean, median, mode, basic notion of probability, expectation, variance and standard deviation, discrete and continuous probability distributions, binomial, Poisson and normal distributions, conditional probability and Bayes theorem

Digital Logic
Switching theory: Boolean algebra, logic gates, and switching functions, truth tables and switching expressions, minimization of switching functions, Karnaugh map.
Combinational logic circuits: Realization of Boolean functions using gates and multiplexers Sequential m/c model: Flip-flops, basic design of counters.

Basics of Programming
The student should be familiar with the basic concepts of programming and should be able to write programs involving the following concepts in any one of the following languages: C, C++ or Java. Conditional constructs, iteration (loops), function or method call, recursion, recursive decomposition of a problem.Basic notions of space and time complexity Parameter passing mechanism, scope, binding

Data Structure: Arrays, lists, stacks, queues, binary tree, binary search tree, Basics of searching and sorting, Graph and its representation
Database Management System: ER Diagram, SQL queries

Computer networks: Network Fundamentals and Communication

Operating system: Memory management and Scheduling

Design analysis and Algorithm: Divide and Conqure, Greedy Approach, Dynamic Programing, Branch and Bound

Software Engineering: Models

PGQP27

Entrance Test for the Course(s): M.A. / M.Sc. (Mathematics) [CUJAM], [CUSBR], M.Sc. (Mathematics) [CUKER], [CUHAR], [CUPUN], [CUKNK], [CURAJ], [CUJHD], [CUAPH], M.Sc. B.Ed. (Mathematics) [CURAJ]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Algebra: Groups, subgroups, Abelian groups, non-abelian groups, cyclic groups, permutation groups; Normal subgroups, Lagrange's Theorem for finite groups, group homomorphism and quotient groups, Rings, Subrings, Ideal, prime ideal. maximal ideals; Fields, quotient field.

Vector spaces, Linear dependence and Independence of vectors, basis, dimension, linear transformations, matrix representation with respect to an ordered basis, Range space and null space, rank-nullity theorem; Rank and inverse of a matrix, determinant, solutions of systems of linear equations, consistency conditions. Eigenvalues and eigenvectors. Cayley-Hamilton theorem. Symmetric, Skewsymmetric, Hermitian, Skew-Hermitian, Orthogonal and Unitary matrices.

Real Analysis: Sequences and series of real numbers. Convergent and divergent sequences, bounded and monotone sequences, Convergence criteria for sequences of real numbers, Cauchy sequences, absolute and conditional convergence; Tests of convergence for series of positive terms-comparison test, ratio test, root test, Leibnitz test for convergence of alternating series.

Functions of one variable: limit, continuity, differentiation, Rolle's Theorem, Cauchy's Taylor's theorem.

Interior points, limit points, open sets, closed sets, bounded sets, connected sets, compact sets; completeness of R, Power series (of real variable) including Taylor's and Maclaurin's, domain of convergence, term-wise differentiation and integration of power series.

Functions of two real variable: limit, continuity, partial derivatives, differentiability, maxima and minima. Method of Lagrange multipliers, Homogeneous functions including Euler's theorem.

Complex Analysis: Functions of a complex Variable, Differentiability and analyticity, Cauchy Riemann Equations, Power series as an analytic function, properties of line integrals, Goursat Theorem, Cauchy theorem, consequence of simply connectivity, index of a closed curves. Cauchy's integral formula, Morera's theorem, Liouville's theorem, Fundamental theorem of Algebra, Harmonic functions.

Integral Calculus: Integration as the inverse process of differentiation, definite integrals and their properties, Fundamental theorem of integral calculus. Double and triple integrals, change of

order of integration. Calculating surface areas and volumes using double integrals and applications. Calculating volumes using triple integrals and applications.

Differential Equations: Ordinary differential equations of the first order of the form $y' = f(x,y)$. Bernoulli's equation, exact differential equations, integrating factor, orthogonal trajectories, Homogeneous differential equations-separable solutions, Linear differential equations of second and higher order with constant coefficients, method of variation of parameters. Cauchy-Euler equation.

Vector Calculus: Scalar and vector fields, gradient, divergence, curl and Laplacian. Scalar line integrals and vector line integrals, scalar surface integrals and vector surface integrals, Green's, Stokes and Gauss theorems and their applications.

Linear Programing: Convex sets, extreme points, convex hull, hyper plane & polyhedral Sets, convex function and concave functions, Concept of basis, basic feasible solutions, Formulation of Linear Programming Problem (LPP), Graphical Method of LPP, Simplex Method.

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PGQP28

Entrance Test for the Course(s): M.Sc. (Physics) [CUJHD], [CUKER], [CUPUN], [CUKNK], [CURAJ], [CUJHD]. M.Sc. B.Ed. (Physics) [CURAJ], (Physics and Astrophysics) [CUHAR], (Computational Physics) [CUPUN]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Mathematical Methods: Calculus of single and multiple variables, partial derivatives, Jacobian, imperfect and perfect differentials, Taylor expansion, Fourier series. Vector algebra, Vector Calculus, Multiple integrals, Divergence theorem, Green's theorem, Stokes' theorem. First order equations and linear second order differential equations with constant coefficients. Matrices and determinants, Algebra of complex numbers.

Mechanics and General Properties of Matter: Newton's laws of motion and applications, Velocity and acceleration in Cartesian, polar and cylindrical coordinate systems, uniformly rotating frame, centrifugal and Coriolis forces, Motion under a central force, Kepler's laws, Gravitational Law and field, Conservative and non-conservative forces. System of particles, Center of mass, equation of motion of the CM, conservation of linear and angular momentum, con-servation of energy, variable mass systems. Elastic and inelastic collisions. Rigid body motion, fixed axis rotations, rotation and translation, moments of Inertia and products of Inertia, parallel and perpendicular axes theorem. Principal moments and axes. Kinematics of moving fluids, equation of continuity, Euler's equation, Bernoulli's theorem.

Oscillations, Waves and Optics: Differential equation for simple harmonic oscillator and its general solution. Superposition of two or more simple harmonic oscillators. Lissajous figures. Damped and forced oscillators, resonance. Wave equation, traveling and standing waves in one-dimension. Energy density and energy transmission in waves. Group velocity and phase velocity. Sound waves in media. Doppler Effect. Fermat's Principle. General theory of image formation. Thick lens, thin lens and lens combinations. Interference of light, optical path retardation. Fraunhofer diffraction. Rayleigh criterion and resolving power. Diffraction gratings. Polarization: linear, circular and elliptic polarization. Double refraction and optical rotation.

Electricity and Magnetism: Coulomb's law, Gauss's law. Electric field and potential. Electrostatic boundary conditions, Solution of Laplace's equation for simple cases. Conductors, capacitors, dielectrics, dielectric polarization, volume and surface charges, electrostatic energy. Biot-Savart law, Ampere's law, Faraday's law of electromagnetic induction, Self and mutual inductance. Alternating currents. Simple DC and AC circuits with R, L and C components. Displacement current, Maxwell's equations and plane electromagnetic waves, Poynting's theorem, reflection and refraction at a dielectric interface, transmission and reflection coefficients (normal incidence only). Lorentz Force and motion of charged particles in electric and magnetic fields.

Kinetic theory, Thermodynamics: Elements of Kinetic theory of gases. Velocity distribution and Equipartition of energy. Specific heat of Mono-, di- and tri-atomic gases. Ideal gas, van-der-Waals gas and equation of state. Mean free path. Laws of thermodynamics. Zeroth law and concept of thermal equilibrium. First law and its consequences. Isothermal and adiabatic processes. Reversible, irreversible and quasi-static processes. Second law and entropy. Carnot cycle. Maxwell's thermodynamic relations and simple applications. Thermodynamic potentials and their applications. Phase transitions and Clausius-Clapeyron equation. Ideas of ensembles, Maxwell-Boltzmann, Fermi-Dirac and Bose Einstein distributions.

Modern Physics: Inertial frames and Galilean invariance. Postulates of special relativity. Lorentz transformations. Length contraction, time dilation. Relativistic velocity addition theorem, mass energy equivalence. Blackbody radiation, photoelectric effect, Compton effect, Bohr's atomic model, X-rays. Wave-particle duality, Uncertainty principle, the superposition principle, calculation of expectation values, Schrödinger equation and its solution for one, two and three dimensional boxes. Solution of Schrödinger equation for the one dimensional harmonic oscillator. Reflection and transmission at a step potential, Pauli exclusion prin-ciple. Structure of atomic nucleus, mass and binding energy. Radioactivity and its applications. Laws of radioactive decay.

Solid State Physics, Devices and Electronics: Crystal structure, Bravais lattices and basis. Miller indices. X-ray diffraction and Bragg's law Intrinsic and extrinsic semiconductors, variation of resistivity with temperature. Fermi level. p-n junction diode, I-V characteristics, Zener diode and its applications, BJT: characteristics in CB, CE, CC modes. Single stage amplifier, two stage R-C coupled amplifiers. Simple Oscillators: Barkhausen condition, sinusoidal oscillators. OPAMP and applications: Inverting and non-inverting amplifier. Boolean algebra: Binary number systems; conversion from one system to another system; binary addition and subtraction. Logic Gates AND, OR, NOT, NAND, NOR exclusive OR; Truth tables; combination of gates; de Morgan's theorem.

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PGQP29

Entrance Test for the Course(s): M.Sc. (Statistics) [CUHAR], [CUPUN], [CUSBR] [CURAJ], (Statistics and Applied Mathematics) [CUTND]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Sequences and Series: Convergence of sequences of real numbers, Comparison, root and ratio tests for convergence of series of real numbers.

Differential Calculus: Limits, continuity and differentiability of functions of one and two variables. Rolle's theorem, mean value theorems, Taylor's theorem, indeterminate forms, maxima and minima of functions of one and two variables.

Integral Calculus: Fundamental theorems of integral calculus. Double and triple integrals, applications of definite integrals, arc lengths, areas and volumes.

Matrices: Rank, inverse of a matrix. systems of linear equations. Linear transformations, eigenvalues and eigenvectors. Cayley-Hamilton theorem, symmetric, skew-symmetric and orthogonal matrices.

Differential Equations: Ordinary differential equations of the first order of the form $y' = f(x,y)$. Linear differential equations of the second order with constant coefficients.

Statistics Probability: Axiomatic definition of probability and properties, conditional probability, multiplication rule. Theorem of total probability. Bayes' theorem and independence of events.

Random Variables: Probability mass function, probability density function and cumulative distribution functions, distribution of a function of a random variable. Mathematical expectation, moments and moment generating function. Chebyshev's inequality.

Standard Distributions: Binomial, negative binomial, geometric, Poisson, hypergeometric, uniform, exponential, gamma, beta and normal distributions. Poisson and normal approximations of a binomial distribution.

Joint Distributions: Joint, marginal and conditional distributions. Distribution of functions of random variables. Product moments, correlation, simple linear regression. Independence of random variables.

Sampling distributions: Chi-square, t and F distributions, and their properties. Limit Theorems: Weak law of large numbers. Central limit theorem (i.i.d.with finite variance case only).

Estimation: Unbiasedness, consistency and efficiency of estimators, method of moments and method of maximum likelihood. Sufficiency, factorization theorem. Completeness, Rao-Blackwell and Lehmann-Scheffe theorems, uniformly minimum variance unbiased estimators. Rao-Cramer inequality. Confidence intervals for the parameters of univariate normal, two independent normal, and one parameter exponential distributions.

Testing of Hypotheses: Basic concepts, applications of Neyman-Pearson Lemma for testing simple and composite hypotheses. Likelihood ratio tests for parameters of univariate normal distribution.

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PGQP30

Entrance Test for the Course(s): M.Sc. (Material Sciences & Tech.) [CUJAM]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Mechanics: Unit vectors, displacement, area element, volume element, velocity and acceleration in Cartesian, Spherical polar and cylindrical coordinate system. Inertial and non-inertial frames of references, uniformly rotating frame; Coriolis force and centrifugal force. Inverse square law of force: Concept of central and non-central forces. Kepler's laws and Satellite motion.

Oscillation: Differential equation and its solution, Compound , torsional pendulum, Oscillation of two masses connected by spring, Driven harmonic oscillator, Solution of differential equation, power absorption and power dissipation, Sharpness of resonance, Quality factor, Electrical resonance.

Relativity: Galilean transformations and conservation laws: conservation of momentum and energy, Search for ether and Michelson-Morley experiment, Lorentz transformations, Length contraction, Time dilation, velocity theorem, mass energy equivalence, Doppler effect.

Vector Calculus: Basic idea of vector algebra, Scalar and vector fields, Gradient of a scalar field and its physical interpretation, Line, surface and volume integrals, Divergence of a vector field and its physical significance, Gauss's divergence theorem, Stokes' theorem.

Electrostatics : Gauss's law in integral and differential forms, Line integral of electrostatic field, Poisson's and Laplace's equations, Dielectrics, Polar and non-polar molecules, Atomic polarizability, Electric susceptibility, Gauss's law in a dielectric medium (differential and integral forms).

Electric current and Magnetostatics: Current and current density, Equation of continuity, Electrical conductivity, Microscopic form of Ohm's law, Biot-Savart's law, Ampere's circuit law (integral &differential forms),Displacement current, Magnetic scalar and vector potentials, Divergence of vector potential, Current loop as a magnetic dipole, magnetic dipole moment and angular momentum.

Time varying fields: Self-inductance of a solenoid, Mutual inductance of two solenoids, Self-inductance of a solenoid, Mutual inductance of two solenoids, Selfinductance and mutual inductance of current loops, Reciprocity theorem of mutual inductance, Relation between self and mutual inductance, coefficient of coupling, Maxwell`s equations, Poynting theorem.

Electromagnetic waves: Electromagnetic waves in vacuum, electromagnetic waves in dielectric medium, Electromagnetic waves in conductor, modified wave equations, skin depth and characteristic impedence.

Heat and Thermodynamics: Conduction, convection and radiation, laws of thermodynamics. Waves: Velocity of transverse waves in a string, velocity of longitudinal waves in a fluid, phase and group velocity, Stationary/standing waves, eigen functions, eigen frequencies.

Optics: Young's double slit experiment, theory of interference fringes, Fresenal's Biprism, Newton's rings, Michelson's interferometer and its applications. Fresnel's diffraction, Fresnel's half-period zones, rectilinear propagation of light, zone plate, diffraction at a straight edge, Fraunhofer diffraction, diffraction grating, width of principal maximum, dispersive & resolving power of grating. Polarization by reflection, Brewster's law, quarter wave plate &half wave plate.

Statistical Mechanics: Macro and micro states, Boltzmann's distribution law, Maxwell's distribution of speeds and velocities, mean, r.m.s. and most probable speeds, Bose-Einstein (B-E) statistics and distribution law, Fermi-Dirac (F-D) statistics and its distribution law.

Quantum Mechanics: Compton Effect, Wave-Particle Duality, Davisson and Germer Experiment, Wave Packet, Phase and Group velocity, Uncertainty Principle, Tunneling effect, Harmonic Oscillator.

Atomic Physics: Larmor's Precession, Bohr's Corresponding Principle, Stern Gerlach Experiment, Vector Atom Model (ls, jj coupling), Normal and Anomalous Zeeman Effect.

Solid state physics: Lattices and bases, unit cell and Winger-Seitz cell, symmetry operations, Bravais lattices in two and three dimensions, Miller indices, Reciprocal lattice and its application to simple cubic, bcc and fcc. Laue`s theory of X-ray diffraction, Bragg`s law, Experimental methods in X-ray diffractions. Einstein`s theory and Debeye`s model of specific heat of solids. Superconductivity, Meissner effect, type I & II superconductors, BCS theory, Schottkey and Frankel defects. Law of crystallography, X-ray diffraction by crystal, Bragg's equation. Determination of crystal structure of ionic solids.

Quantum Optics: Raman effect – classical and quantum mechanical explanation, properties of spectral lines, Luminescence, Optical fibre and its types, Critical angle of propagation, Acceptance angles, Numerical aperture, Pulse dispersion, Attenuation and its various mechanism, Attenuation of light in an optical medium, Population inversion, pumping, Principal pumping schemes (three and four levels), Types of lasers (Ruby, He-Ne and semiconductor).

Electronics: Kirchoff`s law, voltage and current sources, source transformations, maximum power, series RL, RC, LCR circuit, resonance condition, impedence variation, PN junction diode as a half wave and full wave rectifier, ripple factor and efficiency of HWR and FWR, Zener diode and its characteristics, zener diode as a voltage regulator, characteristics of unijunction diode, tunnel diode and light emitting diode, working and characteristics of UJT, SCR, JFET. Characteristics of a transistor in common base and common emitter transistor, operational amplifier and applications, logic gates. Atomic Structure, Chemical Bonding, s and p Block Elements: Idea of de-Broglie matter wave, quantum numbers, effective nuclear charge, Heisenberg uncertainty principle, periodic properties. Molecular orbital theory, dipole moment &

electronegativity difference, types of hybridization. Diagonal relationship, salient features of hydrides, salvation and complexation tendencies in bio-systems, chemistry of fullerenes, carbide, fluorocarbons and inter-halogen compounds.

Acid and Bases: HSAB concept, acid base strength and hardness & softness, symbiosis, non-aqueous solvent; their physical and chemical properties.

Oxidation and Reduction: Use of redox potential data-analysis of redox cycle; redox stability in water, structure and properties of silicon and phosphazene.

Gaseous State: Gas laws, relationship between critical constants and van der Waal's constant, law of corresponding states.

Structure and bonding: Types of hybridization in carbon compounds, bond length, bond angle and bond energy.

Nomenclature of organic compounds: D&L and R&S and E&Z system of nomenclature, mechanism of nucleophilic additions to carbonyl group with particular emphasis on Benzoin aldol, perkin, wittig reaction.

Chemistry of transition elements: General characteristics of 3-D elements, Werner co-ordination theory, effective atomic no. concept, nomenclature of co-ordination compounds. Electronic configuration and characteristics of lanthanides and actinides, lanthanide contraction and application.

Magnetic properties of complexes: Magnetic susceptibility, LS-coupling, application of magnetic moment, data for structure analysis of complexes.

Black body radiations: Stefan`s law, Boltzman law, wein`s displacement law.

Spectroscopy: IR and Raman spectroscopy, vibrational spectroscopy, NMR spectroscopy.

Carbohydrates: Synthesis and properties of monosaccharide and their inter conversions, osazone formation.

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PGQP31

Entrance Test for the Course(s): M.Sc. (Food Science and Technology) [CUPUN]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

DSC- FT- 1A: FUNDAMENTALS OF FOOD SCIENCE AND TECHNOLOGY

PART I

Unit 1 Introduction to Food Science and Technology

- Definition, scope and current trends in food science and technology

Unit II Food Groups, Nutrients and Balanced Diet

- Definition and meaning of food, nutrition, nutrient, health, concept and characteristics of a balanced diet.
- Introduction to basic food groups and nutrients, food pyramid, macro and micronutrients.
- Effect of processing on nutrients.

Unit III Browning reactions in foods

- Classification (enzymatic, non-enzymatic and metallic browning), causes and prevention of browning

Unit IV Cereals and Pulses

- Composition and nutritive value, types of cereals, processing of cereals and pulses (gelatinization of starch and the factors affecting it, germination and fermentation), toxic constituents in pulses, milling of pulses.

Unit V Fruits and vegetables

- Classification of fruits and vegetables, composition and nutritive value; effect of processing on pigments.

Unit VI Chocolate and cocoa products 10 Cocoa bean processing, preparation of chocolate liquor, cocoa butter and chocolate

DSC – FT- 1B : FUNDAMENTALS OF FOOD SCIENCE AND TECHNOLOGY – PART II

THEORY

Unit I Milk and milk products

- Composition and nutritive value
- Introduction to liquid milk technology (clarification, pasteurization, homogenization, fortification, sterilization)
- Types of milk
- Effect of processing on milk,
- Introduction to milk products.

Unit II Eggs

- Composition and nutritive value
- Structure of an egg
- Egg quality and deterioration
- Green ring formation in boiled egg, preservation of eggs
- Egg foams – stages of preparation and factors affecting them
- Effect of heat on egg proteins; functions of eggs in cookery.

Unit III Meat, Fish and Poultry

- Composition and nutritive value
- Selection/purchasing criteria for meat, fish and poultry
- Tenderization of meat.

Unit IV Sugar

- Composition and nutritive value
- Properties of sugars
- Manufacturing/refining of sucrose
- Sugar cookery – crystalline and non-crystalline candies, sugar based products.

Unit V Fats and oils

- Composition and nutritive value
- Types of fats/oils and their functions
- Rancidity in fat and its prevention
- Changes in fat during heating
- Care of fat used for frying, emulsions.

Unit VI Introduction to food hygiene and food adulteration

- Food hygiene, factors affecting food safety, personal hygiene.
- Adulteration, adulterants and their effects on health.

DSC – FT- 1C: BASIC BAKING TECHNOLOGY

Unit 1 Baking Industry

- Baking industry and its scope in the Indian economy.
- History of Bakery - present trends, prospects
- Nutrition facts of bakery products.

Unit II Wheat Grain Technology

- Wheat grain– its structure
- Milling of wheat; types of refined wheat flour; composition of refined wheat flour (gluten, amylose/ amylopectin, enzyme activity, moisture) and its storage

Unit III Cake Technology

- Preparation of cakes - types of cakes; ingredients used; methods of batter preparation; steps in cake making; balancing of cake formula; evaluation of the baked cake; operational faults in cake processing and the remedial measures. Labeling and Packaging. Costing
- Cake decoration- different methods of cake decoration

Unit IV Pastry Technology

- Preparation of pastry - types of pastries (short crust, puff/flaky and choux pastry); ingredients; processing and evaluation. faults and remedies.

DSC- FT- 1D: INTRODUCTION TO FOOD SAFETY AND PRESERVATION

Unit I: Purpose and Scope of Preservation

- Objectives of preservation and processing
- Scope of preservation industry in India.

Unit II: Post-harvest Changes and Spoilage

- Physical, chemical and microbiological changes in fruits and vegetables
- Factors affecting growth of microorganisms and the control measures

Unit III: Food Safety

- Key terms, factors affecting food safety, recent 20 concerns
- Food laws, standards and regulations
- Food additives and contaminants
- Hygiene and sanitation
- HACCP

Unit IV: Principles and Methods of Preservation

- Asepsis
- Use of low temperature,
- Use of high temperature
- Removal of moisture
- Removal of air,
- Use of chemical preservatives
- Fermentation
- Irradiation
- Gas preservation
- Newer methods

Unit V: Fruit and Vegetable Processing – Sauces and Beverages

- Chutney and sauces- definition, method of preservation, steps in preparation of chutney and sauces.
- Fruit beverages- definition and classification, method of preservation (with special emphasis on pasteurization, use of chemical preservatives, sugar), role of various ingredients.

DISCIPLINE SPECIFIC ELECTIVE (DSE)
DSE- FT 1: ADVANCED BAKING TECHNOLOGY

Unit I: Bread Technology

- Preparation of bread - ingredients used; methods of dough preparation; steps in bread processing; evaluation of the baked bread; staling of bread; diseases of bread.

Unit II: Biscuit and Cookies Technology

- Preparation of biscuits and cookies – types; ingredients; processing and evaluation.
- Crackers

Unit III: Food Packaging

- Packaging – it's importance, essential features of an ideal package; various food packaging materials and their characteristics
- recent trends in the field of packaging (active packaging, intelligent packaging, RFID)
- label regulations and designing for packaged foods , nutritional labelling

Unit IV: Marketing and Cost Control

- Marketing - definition, scope, understanding the 4Ps – (Product, Price, Place, Promotion), marketing techniques, marketing and distribution of processed products.
- Cost control – food cost, labour cost and other costs; costing of processed products.

DSE-FT 2: ADVANCED FRUIT AND VEGETABLE PRESERVATION TECHNOLOGY

Unit I: Dehydration and Concentration

- Dehydration- definition and objectives, method of preservation, normal drying curve, water activity, factors affecting rate of drying, sun drying, types of dehydrators (air convection, drum, freeze and vacuum driers) steps in dehydration of fruits and vegetable
- Concentration- definition and objectives, techniques

Unit II: Refrigeration and Freezing

- Definition and objectives, difference between freezing and refrigeration, systems of refrigeration, method of preservation, steps in freezing fruits and vegetables, cryogenic freezing of fruits and vegetable, evaluation.

Unit III: Canning

- Definition and objectives, selection of fruits and vegetables, method of preservation, steps of canning fruits and vegetables (with special emphasis on blanching, exhausting and heat processing), spoilage of canned foods

Unit IV: Introduction to New Food Product Development

- Need and importance for developing a new product, types of new products, challenges, failure of new product

Unit V: Fruit and Vegetable Processing –Pectin Products Preserves and Pickles

- Jam, Jelly and Marmalade- definition, role of pectin and theory of gel formation, method of preservation, steps of preparation, evaluation.
- Preserves- definition, method of preservation, steps of preparation, evaluation, candied, crystallized and glazed fruits.
- Pickles- definition, classification, method of preservation, steps of preparation of vinegar pickles, evaluation.

DSE-FT 3: FOOD SAFETY, HYGIENE AND QUALITY TESTING

Unit I Food Laws and Regulations

- Introduction to food acts laws and standards
- National food safety and standard act
- International standards, regulatory agencies
- Consumer protection act

Unit II Food Quality Management

- Characteristics of quality
- Quality Control,
- Quality Assurance
- Total Quality Management
- Quality Management System
- Good Manufacturing Practices
- Hazard Analysis Critical Control Point System (HACCP)

Unit III Introduction to Food Safety and Hygiene

- Food hygiene
- Factors affecting food safety
- Food spoilage
- Food handling
- Special requirements for high-risk foods,
- Safe food cooking temperature and storage techniques.

Unit IV Hygiene and Sanitation in Food Service Institutions

- Cleaning and disinfection
- Personal hygiene
- Pest control
- Waste disposal

Unit VI Sensory Methods of Food Quality Testing

- Sensation of taste, smell, appearance and flavor, sensory evaluation techniques

Unit VII Objective Methods of Food Quality Testing

- Physical test methods (moisture, acidity, water activity,
- texture, viscosity, colour)
- Simple methods of chemical analysis (protein, fat, water, ash)
- Microbiological sampling and testing.

PGQP32

Entrance Test for the Course(s): M.Sc. (Environmental Science & Tech.) [CUPUN], (Environmental Studies) [CUHAR], (Environmental Science) [CURAJ], [CUKER], [CUJAM], [CUJHD], [CUGUJ], [CUSBR].

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

Earth Sciences: Structure and composition of Environment- Atmosphere, Hydrosphere and Lithosphere, Earth Processes, Mineral and Power Resources in India, Biogeochemical Cycles, Meteorology, Climate Change, Origin and evolution of earth, Mineral and Power Resources in India

Physical and Chemical Sciences: Fundamentals, Atmospheric Chemistry, Water Chemistry, Geochemistry, Green Chemistry. Water - physical characteristics, buffering capacity, Essential and trace elements in living systems, Bio-molecules - chemical components of cells, Biogeochemical cycles – carbon, nitrogen and phosphorus, Hydrological cycle and global water balance, Toxicity of Heavy metals.

Life Sciences:
Origin of life: Theories of evolution, genetic drift, speciation, cell organelles, cell division, modes of reproduction, principles of inheritance, epistasis, mutations, chromosomal aberrations, extra- chromosomal inheritance.
Genetic Material: DNA structure and replication, transcription and translation, chromosome structure, protein structure, mutability and repair of DNA, reverse genetics.

Photosynthesis, Plant growth hormones, Dormancy and seed germination, Respiration
Plant and Animal systematics: Bryophytes, Tracheophytes, Gymnosperms, Angiosperms. Membrane structure and Ion transport, ATPase - structure and function, Photosynthesis, Photoperiodism, Vernalization, RUBISCO.
Animal systematics, physiology and diseases: Cnidaria, Echinodermata, Chordata, Protostomia; Anatomy and physiology of humans; major classes of bacterial and viral pathogens, Apoptosis and cancer, inherited diseases, animal cell culture

Ecology and Environment: Biosphere, Organizational levels of biosphere, Ecosystem: Structure and Types, Food Chain and Energy Flow, Population and Community Ecology, Biodiversity and its Conservation.

***Microbiology and Biotechnology*:** Principles of Microbiology, Microbiology of Air, Water, Soil, Sewage, Recombinant DNA technology, principles of gene cloning, transposition, applications of biotechnology in medicine, industry, agriculture and environment.

***Natural resources and Management*:** Natural Resources-Forest, Water, Minerals, Marine, Energy (Renewable and Nonrenewable) - Sources, Threats, Conservation and Management,

Global Environmental issues: ozone depletion and global warming, Acid rain and Smog, Sustainable Development.

***Environmental Pollution*:** Air, Water, Soil, Noise Pollution- Sources, Causes, Effects, Consequences

***Waste Management*:** Solid waste - disposal, Management; Waste to energy conversion.
***Instrumentation*:** Principles and applications of microscopy, spectrophotometry, centrifugation, radioisotope techniques, electrophoresis and chromatographic separation techniques, Blotting and hybridization techniques.

PGQP33

Entrance Test for the Course(s): M.Sc. (Horticulture) [CUTND]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

Basic Biology: Spontaneous generation theory, prokaryotes vs eukaryotes, functional anatomy, structure and organization of bacteria, fungi and algae – economic importance, methods of sterilization, rhizosphere microorganisms and importance, plant-microbe interactions in soil, microbial transformation of nutrients in soil. Carbohydrates, lipids, proteins and amino acids – occurrence and classification, carbohydrate and lipid metabolism, glycolysis, TCA cycle, pentose phosphate pathway, ETC and oxidative phosphorylation, secondary metabolites – occurrence, classification, functions and applications.

Ecology: Physical environment; biotic environment; biotic and abiotic interactions. Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement. Characteristics of a population; population growth curves; population regulation; life history strategies; concept of metapopulation – demes and dispersal, interdemic extinctions, age structured populations. Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis. Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones. Types; mechanisms; changes involved in succession; concept of climax. Structure and function; energy flow and mineral cycling; primary production and decomposition; structure and function of some Indian ecosystems: terrestrial and aquatic. Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.

Plant Biology: Photosynthesis: Light harvesting complexes; mechanisms of electron transport; photoprotective mechanisms; CO2 fixation-C3, C4 and CAM pathways. Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternate oxidase; photorespiratory pathway. Nitrate and ammonium assimilation; amino acid biosynthesis. Plant hormones: Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action. Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; stomatal movement; photoperiodism and biological clocks. Solute transport and photoassimilate translocation: Uptake, transport and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; transpiration; mechanisms of loading and unloading of photoassimilates. Secondary metabolites - Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles. Responses of plants to biotic and abiotic stresses; mechanisms of resistance to biotic stress and tolerance to abiotic stress. Plant tissue culture and applications, molecular marker technology, transgenic technology – GMOs, transgenic plants for biotic and abiotic stress resistance and quality improvement,

molecular pharming – production of vaccines, therapeutic proteins, industrial enzymes and bioplastics.

Microscopic techniques: Visulization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM, image processing methods in microscopy.

Methods in Field biology: Methods of estimating population density of animals and plants, ranging patterns through direct, indirect and remote observations, sampling methods in the study of behavior, habitat characterization-ground and remote sensing methods.

Horticulture: Scope and importance; global scenario of horticultural crops, classification of horticultural crops – nutritive value of horticultural crops, horticulture zones of India. Systematic botany – terminology, morphology description and classification of root, stem, leaf, influorescence, flower and fruits – flowering mechanism – modes of pollination – asexual/vegetative reproduction – floral biology – fertilization and fruit set, Principles involved in nomenclature.

Landscaping and Gardening: Importance and scope of gardening, gardens in india – concepts of landscape gardening – styles and types of gardens – Hindu, Moghul, English, Italian, Persian and Japanese gardens, ornamental landscaping in environmental protection.

Food Technology: Food processing industries/institutions/food scientists of importance in India, causes of food spoilage, methods of food preservation, post-harvest and storage of fresh fruits and vegetables, preparations of fruits and vegetables for processing, technology of foods of animal origin.

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PGQP34

Entrance Test for the Course(s): M.Sc. (Atmospheric Science) [CURAJ]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

Physics: Properties of Matter, Equations of motion, Gravitation, Keplers laws, Heat and Thermodynamics, Electrodynamics, Optics, Modern Physics and Laws of Radiation.

Mathematics: Ordinary differential equation and their solution, determinants and matrices (Fundamentals), Fourier series, Laplace Transform, Conic Section, Set Theory and Complex Variables. Statistics: Measures of central tendency, dispersion. Significance tests and linear correlation

Computer Science: Fundamentals of Computer, computer architecture, operating systems, Database Management System, Foundation of programming

Earth & Environment: Earth Interior, Distribution of oceans and continents, composition and structure of atmosphere, world climate and climate change, physical environment, Environmental Pollution and its abatement, Environmental Awareness.

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PGQP35

Entrance Test for the Course(s): M.Sc. (Epidemiology and Public Health) [CUTND], M.P.H. (Master of Public Health) [CUKER]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

I. Basic knowledge of medicine and Public Health
II. General Biochemistry and Biotechnology
III. Communicable and Non Communicable diseases and their management
IV. Basic Immunology
V. Biostatistics

PGQP36

Entrance Test for the Course(s): M.Sc. (Yoga Therapy) [CURAJ], [CUKER], PG Diploma (Yoga) [CUKER], M.Sc. (Yoga) [CUHAR], M.A. (Yoga) [CUJAM], Diploma (Yoga) [CUJAM], [CUSBR]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

Foundations of Yoga
Yogic science origin, History and development of Yoga, Etymology and definitions, Misconceptions, Aim and objectives of yoga, True nature and principles of Yoga

English and Communication
Reading Comprehension, Verbal Reasoning, Analogies, Antonyms, Synonyms, Verb Patterns, Sentence Correction, and Sentence Completion, Odd Man Out, Error Editing and Deduction, Spell Check.

General Knowledge and Basic Science
General Knowledge, Capital Cities, Currency, Global Time Zone, Current Affairs , Introduction to cell, tissue, organs and systems, Basic concepts and components of Food and Nutrition

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PGQP37

Entrance Test for the Course(s): M.Com. (Commerce) [CURAJ], [CUKNK], [CUHAR], [CUPUN], [CUSBR], [CUTND], [CUKER], [CUJHD]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following Syllabus:

Micro Economics

1. Definition Nature and scope of economics, Marshall & Robins Views. Utility of Economics, Micro vs. Macromedia of Economics study, Economic Theory and Business Decisions.
2. Utility Analysis, Consumer Behaviour, Consumer's equilibrium. Traditional approach and Indifference curve and Analysis: price income and substitution effects. Some application of indifference Curve Techniques, Elasticity of demand.
3. Production –Equal Product Curves, Scale of Production: Input-Output relationship, cost Curves; Variable cost conditions and law of variable proportions, Producers' equilibrium. Product pricing –market format, perfect competition, Monopoly and imperfect completion.
4. Pricing of Factors of Production, Concept of Marginal Productivity, Theories of Rent, Wages, Theories of Interest and Profit.

Currency and Banking

1. Functions significance of money, various forms of money, Causes, remedies and effects of Inflaction, Deflation and Reflation Indian Money Market, Principles Methods of Note issues, Monetary Standard – Gold Standard, Bi-metallise and Managed Currency Standard.
2. Meaning and significance of credit. Factors influencing the Volume of credit in Country, Credit Creations of Bank, Credit Control by RBI.
3. Functions of Commercial Bank, Types of Banks, Unit and Branch Banking System, concept of Mix Banking, Central Bank and its functions, Reserve Bank of India, State Bank of India, Regional Rural Banks, Progress of Nationalized Banks in India.
4. Concept of Foreign Exchange and Exchange Rate, Factors causing fluctuation in Exchange Control Meaning, Objective and Methods.

Essential of Management

1. Nature, scope and functions of Management, Evolution of Management thought, various approaches to management, Functions of a manager, Introduction to Corporate Social Responsibility.
2. Planning: Objective, Nature and process of planning, SWOT Analysis, formulation of plans, Decision making process. Organising: Objectives, nature and process of organizing formal and informal organization, authority and responsibility, delegation and

empowerment, centralisation and decentralisation, concept of departmentation, Organisation Chart, Line, Staff and functional relationships.

3. Staffing: Concept, Manpower Planning, recruitment, selection, training and development, performance appraisal. Directing: Concept and techniques of Motivation and Leadership. Process and barriers to communication.
4. Controlling: Concept, Need and Techniques. Controlling: concept, process and techniques and control, Management by Objectives (MBO) Management by Exception (MBE), Essentials of effective control, Managerial effectiveness.

Office Management

1. Office: Meaning, importance, activities, emerging trends, concept of paperless office. Office management: Meaning, functions. Office organization: Definition, characteristics, types of organisation, office systems and procedures, charts and manuals. Office location, layout and environment, flow of work.
2. Computer fundamentals: Concept, Components and types of computers. Operating system: Concept, functions, types. Managing files and folders. Internet: Basics, features, methods of access. Applications and benefits of Computerisation and Internet in office. Introduction to word processing and spreadsheets: Templates and creation of documents, editing and formatting, creating tables, basic applications.
3. Office record management: Importance, filing essentials, modern methods of filing, modern filing devices, indexing system. Office Forms: Meaning, principles, design and control of office forms. Office Supplies: Management and control of office supplies. Office Correspondence: Types, centralized and decentralized correspondence, procedure of handling inward and outward correspondence, electronic communication.
4. Office Information System: Concept, basic types and business applications. Planning and designing of Information System: System Development Life Cycle, Flow Charts. Office reports: Types of reports, report writing and precis writing. E-Commerce: Concepts, types, business models, e-payment systems.

Accounting

1. Accounting an introduction : Accounting Standard – national and international, Partnership Accounts – Admission, retirement & death, Dissolution of partnership firm.
2. Absorption, Amalgamation and reconstruction of companies, Liquidation of companies and preparation of a Liquidator’s Final Statement of Account.
3. Hire purchase and instalment accounts, Royalties accounts, insolvency accounts.
4. Branch account: Voyage accounts, Accounts of empties and packages; Insurance Claim for loss of Stock and loss of profit.

Business Organisation

1. Definition, Nature and scope of business, Business and society, Social Responsibility of Business, Factors Determining the size of business unit. Forms of business organization – A Comparative study.
2. Monopolistic combination, Production management, Rationalization & methods of remunerating labour.

3. Organization process – Importance, principles, Various aspects of organization, organization structure, Departmentation, Line and Staff Relationships, Span of control, Delegation of authority, Decentralization.
4. Produce and stock Exchange : its organization and economic functions.

Statistical Methods

1. General – The Nature and scope of statistics: Definition of statistics. Law of statistical Regularity: Law of Inertia of Large Numbers. Probability and sampling. limitations of statistics.
2. Methods of statistical Enquiry – Types and characteristics of Units. Methods of collection of data; Questionnaire and schedule; pproximations and accuracy, errors and their effects.
3. Classification and Tabulation – Objects, generalrules for the construction of tables; statistical series.
4. Measure of Central Tendency – Mean Mode, Median, quartile Harmonic and geometric mean.
5. Measurement of Disperson and skewness – Range, quartile deviation, mean deviation, standard deviation and their coefficients; Measures of skewness.
6. Correlation Analysis – Graphic method, scatter diagram, Karl Pearson's coefficient of correlation, Spearman's ranking method, Lag and Lead, probable and standard error.
7. Regression Analysis – Linear regression, regression lines, regression equations.
8. Interpolation – Assumptions, Newtons' advancing differences, larganges' formula; parabolic curve method; binominal expansion method.

Public Finance

1. Public Finance – Definition and Scope; Public and Private finance.
2. Public revenue – Sources of Public revenue; Nature and Principles of taxation; classification of taxes; problems and principles of equity in taxation. Incidence of taxation; shifting of taxes. Effects of taxation. Requirements of a sound tax system. Canons of taxation.
3. Principle of maximum social advantage.
4. Public Expenditure – Classification, effects and canons of public expenditure, Public debt, External and internal debt. Methods of debt redemption. Capital levy, Deficit financing.
5. Indian Public Finance – Financial relations between the Central Government, State Government and local bodies, Finance commission, Financial Administration, Budget- Its preparation, legislation and execution.
6. Analysis of trends in Central Government's Revenue, Expenditure and debt. Financing of five year plans, Deficit financing in India.
7. State and local finance, Heads of revenue and items of expenditure and related issues.

Business Law

Main Principles of Indian law relating to:

1. Contract
2. Agency, Sale of Goods
3. Partnership, Negotiable Instruments and Hundies and Consumer Protection Act 1986

4. Common Carriers and Carriage of Goods of Land and Air. Foreign Exchange Management Act. 2000 : Definitions & Main provisions.

Cost Accounting

1. Definition, Nature, Scope and Significance, Cost Unit, Cost Centre, Elements of Costs, System of ascertainment of cost, Control and ascertainment of Materials, Labour and Overhead Costs, Allocation, Apportionment and Absorption of Overheads.
2. Single Output or Unit Costing, Contract and Job Costing, Calculation of Tender, Quotation, Estimated Price, Process and Operating Costing
3. Marginal Costing – its use in Management Standard Costing, Variance Analysis.
4. Integrated Accounts, Reconciliation of Cost and Financial Accounts, Cost Accounting/ Cost Control Accounts, Interfirm Comparison.

Company law and Secretarial Practice

1. Company: Definition, Classification, Incorporation, Memorandum of association, Articles of Association. Doctrine of constructive notice, Doctrine of Indoor management, Commencement of Business. Company Management: Appointment, Rights and obligations of Directors, Managers and secretary.
2. Steps before issue of prospects, Definition and contents of prospectus, Liability for untrue statements. Shares: Definition, share Vs stock, classes of shares, voting rights, issue of shares at per, premium and discount, ESOP, Bonus, Rights, Buyback, Public shares at par, premium and discount, ESOP, Bonus, Rights, Buyback, Public issue, Calls, Forfeiture, Lean and Surrender, Transfer and transmission, statutory restriction on transfer, Borrowing power, mortgages and changes, Debentures.
3. Secretarial Practice: Duties and responsibilities of Company Secretary, secretarial duties relating to issue and allotment of shares, Calls, forfeiture Lien and transfer of shares. Majority powers and minority rights, revelation of oppression and management. Specimen of certificate of incorporation. Certificate of commencement of Business, Share certificates and share warrants, Dematerialization of shares.
4. Meeting and proceedings: Provisions relating to the company and Board meetings, Secretarial duties relating to meetings, Notice, Agenda, Proxy, Motion, Resolution, Minutes and Reports.

Selling and Advertising

1. Selling : Concept, Nature and Role in Marketing. Personal Selling: Evolving face of Personal Selling, Nature and importance of Personal Selling, Characteristics of a successful salesperson, Sales as a career option, Sales training, Consumer psychology and buying motives, Selling of consumer and Industrial Products (goods and services)
2. Selling process: Prospecting, Pre-approach, Approach, Sales presentation and demonstration, Handling objections, Closing the sale, After sale service. Effective selling techniques, role of relationship marketing in personal selling, tools of selling, Motivating and Remunerating Salespersons.
3. Advertising: Concept, role, functions, scope and types, Economic, Social, Legal and Ethical aspects of Advertising. Advertising Appeals: Meaning, types and methods, Advertising as a persuasive communication process. Advertising Design: Characteristics and basic elements of Advertising copy. Creation, Production and Planning of

Advertisements. Advertising Budget: Types, components and process of preparing. Advertising Agency: Functions and selection of agency.

4. Advertising as a component of Integrated Marketing Communication, AIDA and DAGMAR model. Advertising Media: Types (Print, Outdoor, Electronic and other), Characteristics, merits and limitations of each media type. Media planning: Selection of media category; their reach, frequency, impact, cost and other factors influencing media choice. Problems in reaching rural and remote audience. Evaluation of Advertising effectiveness: Importance, difficulties and methods of measuring advertising effectiveness.

Business Mathematics

1. Calculus : (Problems and theorems involving trigonometrically ratios are not to be done) Differentiation: Partial derivatives up to second order; Total differentials. Maxima and minima cases of one variable involving second or higher order; Cases of two variables involving not more than one constraint, Integration as anti-derivative process; Standard forms; Methods of regration –by substitution, by parts, and by use of partial functions; Definite regration; Finding areas in simple cases.
2. Matrices and Determinants: Definition of a matrix, Types of matrices; Algebra of matrices; Properties of determinants; Calculation of values of determinants upto Third order, Adjoint a matrix; elementary row or column operations; Finding inverse of a matrix through adjoint and elementary row and column operations; Solution of a system of linear equations having unique solution and involving not more than three variables.
3. Linear Programming – formulation of LPP: Graphical method of solution; Problems relating to two variables including the case of mixed constraints; Simplex Method – solution of problems upto three variables, Duality, Transportation Problem.
4. Compound interest and annuities certain, different types of interest rates; concept of present value and amount of a sum; equation of payments, types of annuities; present value and amount of an annuity, including the case of continuous compounding; analysis of annuity; valuation of simple loans and debentures; problems relating to sinking funds.

Insurance Law and Accounts

1. 1.Introduction to Insurance: Purpose and need of insurance, Insurance as a social security tool; Insurance and economic development, Fundamentals/ Principles of Insurance. Contract of Insurance.
2. Life Insurance – Principles and practice of life assurance. Life assurance contract, their nature and characteristics, Parties to the contract and their rights and duties. Conditions and terms of policy. Nominations and Assignment Practice in connection with collection of premium, revivals, loans, surrenders, claims, bonuses and annuity payments, Mortality Table.
3. Fire Insurance - The basic principles of Fire Insurance contracts. Fire Policy, conditions, Assignment of Policy, Claims. Marine Insurance – General Principles – Insurable interest and value disclosure Marine Policy and their conditions, Premium double insurance: assignment of policy warranties the voyage, Loss and abandonment: partial losses and particular charges; salvage; total losses and measures of indemnity, Subrogation.
4. Insurance Intermediaries – Agents and Procedure for Becoming and Agent: Pre requisite for obtaining a license: Duration of license; Cancellation of license, Revocation of

suspension/ termination of agent appointment; Code of conduct; Unfair practices, Insurance Accounts – Life Insurance and General Insurance Company.

Income Tax Law and Accounts

1. Basic Concepts : Income, agricultural income, casual income, assessment year previous year, gross total income, total income person. Tax evasion, avoidance and tax planning. Basic of Charge; Scope of total income, residence and tax liability, income which does not form part of toal income. Deduction from Gross total income.
2. Head of the Income: Salaries; Income from house property; Profit and gains to business or profession. Capital gains; Income from other sources.
3. Computations of total income of an individual, H.UF and firm.
4. Deemed income: Aggregation of Income, Set-off and carry forward of losses; Tax Authorities; Assessment procedures.

Contemporary Audit

1. Introduction: Meaning and objectives of auditing : Types of audit; Internal audit. Audit Process: Audit programme; Audit and books; Working papers and evidences; Consideration for commencing an audit; Routine checking and test checking. Internal Check System: Internal Control.
2. Audit Procedure: Vouching; Verification of assets and liabilities. Audit of Limited Companies: Company auditor- Appointment, powers, duties, and liabilities.
3. Auditing Standards – Appointment, power, duties and liability of Auditor. Broad Outlines of Company audit and auditor's report. Special audit – Banking companies, Educational Institutions, Insurance companies. Investigation, Audit of non profit organisation, Divisible Profit & Dividend.
4. Recent Trends in Auditing – Nature and significance of cost audit; Tax audit, Management audit, Computerised Audit.

Indian Economic Structure

1. Nature of Indian Economy, Features of a developing economy. Characteristics and problems of Indian Economy. Objectives of economics planning in India. India's five year plans – Achievements and failures. Indian agriculture – Its features and problems. Agricultural development in planned era. Green revaluation, Agricultural marketing, Rural poverty and indebtedness. Rural industrialisation. Rural Development programmes. Cooperative movement.
2. Population growth and population explosion. Population policy and programmes. Problem of unemployment. Forms of unemployment. Employment programmes and poverty alleviation. 3.Large scale, small scale and cottage industries. Industrial development during five year plans. Public sectors and private sector. Industrial relations. Industrial policy. Industrial Sickness, Industrial finance. Money Market and Capital Market structure. Capital Formation, Indian Money Market and Fiscal policies, Deficit financing and its implications.

Marketing, Practice and Finance

1. Introduction: Nature and scope of marketing: Importance of marketing as a business function and in the economy; Marketing concepts- traditional and modern; Selling Vs. Marketing; Marketing mix; Marketing environment.
2. Consumer Behaviour and Market segmentation; Nature, scope and significance of consumer behaviour; Market segmentation Concept and importance; basis for market segmentation Promotion; Methods of promotion; Optimum promotion mix; Advertising media – their relative merits and limitations; characteristics of an effective advertisement; Personal selling; Selling as a career; Classification of a successful sales person; Functions of salesman.
3. Product: Concept of product, consumer and industrial goods; Product planning and development; Packaging – role and functions; Brand name and trade mark; After sales service; Product life cycle concept. Price: Importance of price in the marketing mix; Factors affecting price of a product / service; Discounts and rebates.
4. Distribution Channels – concept and role; Types of distribution channels; factors affecting choice of a distribution channel; Retailer and wholesale; physical distribution of goods; Transportation; warehousing; inventory control; order processing.

Macro- Economics

1. Concept – Definition and scope of Macro-Economics, Statics and Dynamics, The Circular flow of Income. The Analysis and Measurement of Economic Activity – National Income Accounting – Concept and Definitions of National Income. Various component of National Income, Methods of Measurement of National Income and Welfare.
2. The consumption function – The Keynesion Comsumption Function, Relative Income Hypothesis, Permanent Income Hypothesis Multiplier and the Process of Income – Propagation. The investment function – Autonomous and Induced investment. Government and the Theory of Income Determination – Government Purchases and Income, Taxes and Equilibrium level of Income, Tax Multiplier Determination of the Equilibrium Level of Income – The Simple Keynesian Model.
3. Marginal Efficiency of Capital, Relation between MEC and MEI. The Derivation and Shift in IS and LM Curves, the Interaction between IS and LM Curves. The Acceleration Principle. Theories of Employment – Say's Law of Market and Classical Theory of Employment, Saving Investment Analysis. An outline of Keynesian Theory of mployment.
4. Theory of Inflation – Concepts of Inflation, Inflationary Gaps Demand Pull and Cost Push Inflation. The Philips Curve, Effects of Inflation, Anti-Inflation Policies – Mentary and Fiscal Policies. Fluctuation and Growth – Hawtrey, Hayek, Sehumpeter, Samuelson, Hicks. Theories of population – Malthusian Theory and Theory of Optimum Population.

Trade of India

1. Introduction – Trade its meaning and types. Difference between internal and international trade. Theories of International Trade with particular reference to the theory of comparative cost. Trade : Terminology and abbreviations. India's Internal Trade-Characteristics and Problems. Coastal trade and trade of Uttar Pradesh.

2. Foreign Trade of India – Brief history before independence Recent trends in India's Foreign Trade. Composition of Imports and Exports – Changes during planning period. Important items of imports and exports.
3. Direction of India's Foreign Trade – Changes in Directional pattern during planning period. India's Major trading partners. State trading Organisations, Financing of India's foreign trade role of EXIM, Bank ECGC and other institutions in financing of foreign trade, STC MMTC.
4. Trade Policy in India – General Developments during planning period. Import substitution and Export promotion. Recent changes in trade policy, Trade agreements – Bilateral and Multilateral Trade Agreements. GATT & UNCTAD. India's Balance of Trade and Balance of Payments – Trends during planning period. Problems of Bot, BOP and corrective measures.

Applied & Business Statistics

1. Statistical System in India- Indian Statistical Machinery – Organisation at Central State level, National Sample Survey – Design and Technique. Agricultural Statistics in India – Nature of Crop estimates, estimation of Area and yield, Industrial Statistics, Annual Survey of Industries. Statistics of Prices, Wage, Trade and Transport.
2. Population statistics – Vital statistics, Computation of birth, death and survival rates. Methods of population projection. Population census in India.
3. Analysis of Time series – Trend Measurement Different Method of Computing Seasonal Indices. Cyclical and Irregular-Fluctuations.
4. National Income Statistics: Methods of Measuring National Income and Related Aggregates. Statistical Quality Control Construction and uses of control charts.

Law and Practice of Banking

1. The Ordinary, practice of bankers with regard to the opening and conduct of banking accounts, closing of accounts. Banker and customer – General and special relations.
2. Law relating to cheques, bill of exchange and other negotiable instruments. Discounting of Bill of Exchange, the practice relating to cheques bills of exchange and other negotiable instruments.
3. Banker's credit, advance and overdrafts Traveller cheque, letter of credit, confirmed bankers credit, unconfirmed bankers credit, acceptance credits and documentary credit.
4. Revolving credit, banker's advance against marketable securities, goods & produce, debentures and life insurance policies. Unsecured advances – guarantees, precautions/ duties of Banker.

Development Banking

1. Meaning, determinant and obstacles of economic development, sources and problems of Rural and Industrial Finance.
2. Meaning objective, characteristics and functioning of Development Banks, Difference between Commercial and Development Banks
3. Role of Commercial Banks in Agricultural and Industrial Finance. Terms lending operations of Land Development Banks.
4. National Bank for Agricultural and Rural Development (NABARD) – Objectives organisation and functions.

5. Structure of Development Banks in India, progress of these banks (terms lending institutions) and deficiencies in their working.
6. National Level Financial Corporation – IFCI, IDBI, ICICI & IRBI – their objectives functions and evaluations of performance.
7. State level Financial Corporation – SFCs and SIDCs – their objectives organizations, functions and evaluations of performance.
8. Capital Market in India & Industrial Growth – Structure, present position, problems and steps taken by the government to active and Capital market.

Quantitative Economics

1. Economics of a Fir – Applications of differential calculus, cost minimization, Profit Maximization, Price – Quantity Determination, Elementary Partial Differentiation and Economic application, Partial Elasticition, Elementary Integral calculus and Economics applications.
2. Linear programming – Meaning, Application, limitation Simple formulation, Graphic method, simplex method duality.
3. Games theory – Classifying pay off matrix, principle of dominance, Strategy – Pure Strategy and mixed strategies – 2x2mx2, 2xn games.
4. Decision Theory Decision making under risk, decision making under inconstanity-Maximum Criterion, Maximax Criterion, Hurvics, criterion savage criterion, laplace criterion Inventory Economics – Inventroy costs, various inventroy models – EOQ with uniform demand, production inventory model, Back-order inventory model Inventory model with quantity discount, price break approach, Re-order point safety stock and stock-outs, determining optimum safety stock levels, ABC analysis.
5. Input- Output Analysis – Meaning assumption viability of system, technological coefficient closed & open economy, determination of out-put labour requirement price equibrium and value added.
6. Query Problems – Query discipline formulae for solving single-channel quering problems.

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PGQP38

Entrance Test for the Course(s): MBA (Management Studies) [CUHAR], (Master of Business Administration) [CURAJ], [CUKNK], [CUJAM], [CUTND] [CUKER], (Master of Business Administration (Marketing Management)) [CUJAM], (Master of Business Administration (Human Resource Management)) [CUJAM], (Master of Business Administration (Executive)) [CUJAM], (Master of Business Administration (Tourism and Travel Management)) [CUJAM], [CUKER] [CUKNK], (Master of Business Administration (Agri-businesses)) [CUPUN],(Master of Business Administration (Tourism and Hospitality Management) [CUTND], (Master of Business Administration (Textile Management)) [CUTND], (Master of Business Administration (Apparel Management)) [CUTND], (Master of Business Administration (Retail Management)) [CUTND], MTTM (Tourism and Hotel Management) [CUHAR], MHMCT (Tourism and Hotel Management) [CUHAR]

The question paper will comprise of 100 MCQs from the following discipline. *i.e.*
English/Verbal Ability: Reading comprehension, verbal reasoning, syllogisms, analogies, antonyms and synonyms, fill in the blanks, sentence correction, idioms, etc.

Maths/Quantitative Ability: Number systems, geometry, trigonometry, probability, permutation combination, algebra, mensuration, time and work, averages, percentages, profit and loss, quadratic and linear equations, etc.

Data Interpretation: Interpretation and analysis of data based on text, tables, graphs (line, area), charts (column, bar, pie), venn diagram, etc.

Logical Reasoning: Clocks, calendars, binary logic, seating arrangement, blood relations, logical sequence, assumption, premise, conclusion, linear and matrix arrangement, etc.

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PGQP39

Entrance Test for the Course(s): M.A. (Fine Arts) [CUPUN]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Art history: European art history, Indian art history. Renascence in art, paintings painted during renascence. Post renascence paintings, painters in Indian and Europe. Biographies of European and Indian painters, Museums and art galleries of India

Fundamentals of art: Types and expressions. Painting from memory, painting an object, Calligraphy, types of fonts and medium.

Sculpture: Indian sculpture, Iconography in Indian and European Art. Carving tools and stones. Famous sculptures of India and Europe.

Printing Technology: Lithography, offset, screen printing, inkjet and other methods of printing. Types of paper and paper sizes. Etching and methods of pattern transfer.

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PGQP40

Entrance Test for the Course(s): M.Lib.I.Sc. (Library and Information Science) [CUGUJ] [CUHAR] [CUPUN] [CUTND], M.A. (National Security Studies) [CUJAM], (Cultural Informatics) [CURAJ], (Development Studies) [CUSBR], (Defense and Strategic Studies) [CUGUJ], (Tibetan) [CUJHD], (Folkloristic and Tribal Studies) [CUKNK], (Folklore) [CUJHD], (Anthropology) [CUJHD], (Gandhian Thought and Peace Studies) [CUGUJ], (Gender Studies) [CUGUJ], M.Sc. (Digital Society) [CURAJ], PG Diploma (Media writing & digital communication) [CURAJ], (NRI Laws) [CUKER], (Indian Scripts-Brahmi and Sharda) [CUJAM], (Shavism) [CUJAM], (Indian Mystical Thoughts) [CUJAM], LLB (Law) [CUHAR], Diploma (Petroleum Geosciences) [CUSBR], Certificate Course (Research Methods and Data Analysis Techniques) [CUJAM]

The question paper will comprise of 100 MCQs from the following discipline. *i.e.* English, Numerical Aptitude/Data Interpretation, Analytical Skills, Reasoning, General Aptitude, General Knowledge.

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PGQP41

Entrance Test for the Course(s): M.A. (Journalism and Mass Communication) [CUHAR], [CUSBR], [CUKNK], [CUPUN], (Culture and Media Studies) [CURAJ], (Mass Communication and New Media) [CUJAM], (Mass Communication) [CUTND], [CUJHD]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

- General Awareness of Indian Political and Economic Environment
- International Developments (Political and Entertainment)
- Awareness of current Public issues
- Indian history and Social Science
- Information Communication Technologies and its application in Media Industry
- Mass Media and Society

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PGQP42

Entrance Test for the Course(s): M.A. (International Relations & Political Science) [CUKER], (Political Science) [CUHAR], [CUPUN], [CUGUJ], [CUAPH], (Public Policy & Public Administration) [CUJAM], (Public Policy, Law and Governance) [CURAJ], (Public Administration & Policy Studies) [CUKER], (Politics and International Relations) [CUGUJ], [CUPUN], (Political Science with specialization in International Relations) [CUJHD], (Public Administration) [CUJHD] [CUKNK], (Political Science and International Relations) [CUSBR]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

1.

a) Western Political Philosophy: Plato, Aristotle, Machiavelli, Hobbes, Locke, Rousseau, J.S. Mill, Karl Marx
b) Modern Indian Political Thought: Gandhi and Ambedkar.
c) Political theory: Concepts of liberty, equality, justice, sovereignty, citizenship, stated. International Relations: Cold War politics, NAM, SAARC, UNO, India's foreign policy particularly with China, Pakistan and USA.
d) Indian Government and Politics: Making of the Constituent Assembly, parliament, cabinet, prime minister, president, state government, federalism, political parties (national and regional), elections, and local government.
e) Comparative Government and Politics
f) Public Policies in India

2. General issues of contemporary relevance

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PGQP43

Entrance Test for the Course(s): M.P.Ed. (Physical Education) [CUPUN] (Physical Education and Sports) [CUHAR], [CUPUN]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

1. Historical Perspective: Physical Education in Ancient Greece, Physical Education and Sports in Rome. Physical Education in Sparta and Athens, Physical Education in India during Ancient period.

2. Philosophical Perspective: Meaning, Definition, Aims and Objectives of Physical Education. Nature, scope and Philosophy of Physical Education. Idealism, Pragmatism, Naturalism and Realism and their implication for Physical education.

3. Psychological Perspective: Psycho-physical unity of human organism, laws of learning, their application to sports situations. Theories of play, Learning stages, learning curves, transfers of training. Practical application of Psychology of Physical Education. Personality and its types.

4. Sociological Perspective: Orthodoxy, Customs, Traditions and Physical Education. Festivals and Physical Education. Socialization through Physical Education, Social Conglomeration and Social group, Primary group and Remote group. Features and Importance of Culture. Impact of Culture on life style.

5. Introduction to Sports Training: Meaning and Definition of Sports; Aims & Objectives of Sports Training; Principles of Sports Training; System of Sports Training-Basic Performance, Good / High Performance.

6. Kinesiology & Sports & Physiology: Meaning & Definition of Kinesiology Importance of Kinesiology & Sports Bio-Mechanics in field of Physical Education; Terminology of fundamental Movements; Centre of Gravity, Equilibrium, Line of Gravity.

7. Introduction to Research: Definition of Research, Need & importance of Research in Physical Education; Classification of Research; Research problem, Meaning, Criteria of Selection of Problem, formulation of Research Problem, Limitation and Delimitations of Research.

8. Bio-Mechanics: Body lever and their types; Motion: Laws of Motion; Centre of Gravity, Equilibrium; Static and Dynamic Forces, its direction and application; Speed acceleration and momentum.

9. Measurement and Evaluation in Physical Education: Meaning and Importance of test, measurement and evaluation; Basic principles of evaluation; Formative and summative

evaluation; Classification of Test: Knowledge test, fitness test, Skill test; Criterion for the selection test: Validity, reliability, objectivity, norms and standard.

10. Physical Fitness Tests: AAHPER Youth Fitness Tests, National Physical Fitness Tests, Indiana Motor Fitness Tests, JCR Tests.

11. Human Body: Circulatory System, Functions of Blood, Blood Groups, Transfusion, Clotting, Structure of Heart, Properties, Circulation of Blood, Cardiac Cycle, Blood Pressure, Blood Vessels. Digestive System, Organs of digestions, their Structure and Functions and intestines, food metabolism, Excretory System. Structure & function of Kidneys and Skin.

12. Muscles: Origin, Insertion and Action of Following: Pectoralis Major, Pectoralis Minor, Serratus Anterior,Rectus Abdominus, Trapezium, Deltoid, Teres Major, Bisceps (Bronchic), Triceps Latissimus Dorsi, Rectus Femories (Vestus Leteralis), Vestus Medialis (Vestus Intermedius)

13. Sports Injuries: Body Lever & their types, Motion, Laws of Motion, Centre of gravity, equilibrium, Static & Dynamic Forces its direction and Application, Speed Acceleration & Momentum.

14. International Movements in Sports: Ancient and modern Olympics Games, Asian Games, Common Wealth Games.

15. Central Advisory Board & Recreation: Nation Discipline Scheme, Kaual Kapoor Committee, National Physical Efficiency Drive, Kunzuru Committee, All India Council of Sports, Sports Authority of INDIA (SAI), N.S. National Institute of Sports, L.N.I.P.E. Institute of Sports, National Sports Association / Federation their Composition and function.

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PGQP44

Entrance Test for the Course(s): M.A. (Economics) [CURAJ], [CUGUJ], [CUHAR], [CUJAM], [CUTND], [CUKER], [CUPUN], [CUKNK], [CUSBR], [CUAPH], M.Sc. B.Ed. (Economics) [CURAJ]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Micro Economics

Consumer Theory or Behaviour: Demand, Utility, Indifference Curve, Revealed Preference Theory, Consumer Surplus

Production Theory: Production Function, Law of Variable Proportions, Returns to Scale, Cost Function, types and concepts

Price and Output determination in Market: Perfect and Imperfect Competition (Monopoly, Price Discrimination, Monopolistic, Duopoly and Oligopoly models)

General Equilibrium, Efficiency and Welfare: Equilibrium and efficiency under pure exchange and production; overall efficiency and welfare economics, externality

Macro Economics

National Income Accounting,

Income and Output Determination: Aggregate Demand and Aggregate Supply, Effective Demand Principle, Classical and Keynesian Theory

Money and Inflation: Demand and Supply of Money, Money Multiplier and High Powered Money, Credit Creation, Role of Reserve Bank of India and Commercial Banks, Quantitative Theories of Money, Philip's Curve

Monetary and Fiscal Policy of India and Its Role

Consumption and Investment Function: Permanent, Relative and Life Cycle Hypothesis, determinants of business fixed investment; residential investment and inventory investment, Multiplier and Accelerator

Open Economy Models: Mundell and Fleming Model (IS,LM and BP curve) , Balance of Payments, exchange rate determination, Purchasing Power Parity

Economic Growth: Harrod-Domar Model, Solow Model

Statistical Methods in Economics

Mean, Mode, Median, Dispersion, Skewness, Quartile Deviation, Average Deviation, Standard Deviation

Correlation

Simple Regression Model Probability Distribution Sampling

Mathematical Methods in Economics

Sets and Vector

Functions of one and several real variable

Single and Multi variable optimization

Integration of functions

Difference equations
Determinants Matrix
Linear Programming
Probability
Differential Equations

Indian Economy

Overview of colonial economy.

Macro Trends: National Income; population; occupational structure.

Agriculture: Agrarian structure and land relations; agricultural markets and institutions – credit, commerce and technology; trends in performance and productivity; famines.

Railways and Industry: Railways; the de-industrialisation debate; evolution of entrepreneurial and industrial structure; nature of industrialisation in the interwar period; constraints to industrial breakthrough; labour relations.

Economy and State in the Imperial Context

The imperial priorities and the Indian economy; drain of wealth; international trade, capital flows and the colonial economy – changes and continuities; government and fiscal policy.

New Economic Policy

Public Economics:

Public and Private Goods, **Externalities, Budget, Deficits, Public Debt, Fiscal Federalism in India,**

Taxation: its economic effects; dead weight loss and distortion, efficiency and equity considerations, tax incidence, optimal taxation.

International Trade Theories: Adam Smith, Ricardo, Heckscher-Ohlin model and New Trade Theories

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PGQP45

Entrance Test for the Course(s): M.Tech. (Energy Engineering) [CUJHD]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

i. Basics of energy and
ii. Relevant topics from Mechanical/ Electrical/ Electronics/ Chemical Engineering, and Physics and Chemistry.

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PGQP46

Entrance Test for the Course(s): M.A. (Psychology) [CUHAR], [CUPUN], M.A. /M.Sc. (Psychology) [CUSBR] (Sports Psychology) [CURAJ], M.Sc. (Psychology) [CUKNK], (Applied Psychology) [CUTND], [CUAPH]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Introduction to Psychology, History of Psychology, Schools of Psychology, Biological bases of Behaviour, Learning, Memory, Sensation and Perception, Emotion and Motivation, Intelligence, Personality, Psychological Testing, Life-span Development, Abnormal and Clinical Psychology, Statistics for Psychology.

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PGQP47

Entrance Test for the Course(s): M.A. (Gujarati) [CUGUJ]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Unit:1 ગુજરાતી સાહિત્યનો ઈતિહાસ (History of Gujarati literature)

(અ) મધ્યકાલીન ગુજરાતી સાહિત્ય (Medieval Gujarati Literature)

(બ) અર્વાચીન ગુજરાતી સાહિત્ય (Modern Gujarati literature)

- દલપતરામથી આજ પર્યંત (Dalapatram from today)

(ક) ગુજરાતી સાહિત્યના વિવિધ પ્રવાહો (Various trends in Gujarati literature)

(ડ) ગુજરાતી સાહિત્યનું ઈતિહાસ લેખન (History of Gujarati literature)

Unit:2 સાહિત્ય સિધ્ધાંત (Literary formulas)

(અ) ભારતીય સાહિત્યવિચાર (Indian literature)

(બ) પાશ્ચાત્ય સાહિત્યવિચાર (Western literature)

(ક) સાહિત્યિક વાદો (Literary Isms)

Unit:3 ગુજરાતી વિવેચન (Gujarati critique)

Unit:4 ભાષાવિજ્ઞાન (Linguistics)

Unit:5 વિશ્વસાહિત્ય/ તુલનાત્મક સાહિત્ય

(Universities / Comparative Literature)

Unit:6 સાહિત્ય અને આંતરવિદ્યાઓ (Literature and Inter-disciplines)

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PGQP48

Entrance Test for the Course(s): M.A. (Chinese) [CUGUJ]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

1. Chinese Language based questions (from elementary to advanced level including grammar, sentence structure, idioms, idiomatic expressions, synonyms, anonyms, arranging various sentences in a meaningful construction etc.)

2. Questions based on: Chinese history, culture, society, Chinese / CPC politics and government structure, Chinese geography, General awareness about current affairs concerning China, Chinese literature etc.

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PGQP49

Entrance Test for the Course(s): M.A. (German Studies) [CUGUJ]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

- Language structures, usage & grammar (CEFR1 Level = B2.2)
- History, Geography & Current Affairs of the German-speaking countries
- German Literature – Grimm's Fairytales, Fables, post-1945 Short Stories, important figures from the History of German Literature
- Translation from German « English
- Basics of Linguistics

PGQP50

Entrance Test for the Course(s): M.Sc. (Nanosciences) [CUGUJ]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

INORGANIC CHEMISTRY

Quantum numbers and their significance. s, p, d, f block elements, the long form of periodic table. Detailed discussion of the following properties of the elements, with reference to s & p-block. Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table. General characteristics, types of ions, size effects, radius ratio rule and its limitations. Packing of ions in crystals. Born-Landé equation with derivation and lattice energy. Madelung constant, Born-Haber cycle and its application, solvation energy. Lewis structure, Valence Bond theory, Molecular orbital theory. Formal charge, Valence shell electron pair repulsion theory (VSEPR), Redox equations, Standard Electrode Potential and its application to inorganic reactions. Bronsted-Lowry concept of acid-base reactions, solvated proton, relative strength of acids, types of acid-base reactions, levelling solvents, Lewis acid-base concept, Classification of Lewis acids, Hard and Soft Acids and Bases (HSAB) Application of HSAB principle. Inert pair effect, diagonal relationship Allotropy and catenation. Complex formation tendency of s and p block elements. Study of the compounds with emphasis on structure, bonding, preparation, properties and uses. Boric acid and borates, boron nitrides, borohydrides (diborane) carboranes and graphitic compounds, silanes, Oxides and oxoacids of nitrogen, Phosphorus and chlorine. Peroxo acids of sulphur, interhalogen compounds, polyhalide ions, pseudo halogens and basic properties of halogens. Werner's theory, valence bond theory (inner and outer orbital complexes), electro neutrality principle and back bonding. Crystal field theory, measurement of 10 Dq (Δo), CFSE in weak and strong fields, pairing energies, factors affecting the magnitude of 10 Dq (Δo, Δt). Octahedral vs. tetrahedral coordination, tetragonal distortions from octahedral geometry Jahn-Teller theorem, square planar geometry. Qualitative aspect of Ligand field and MO Theory.

PHYSICAL CHEMISTRY

Intensive and extensive variables; state and path functions; isolated, closed and open systems; zeroth law of thermodynamics. First law: Concept of heat, q, work, w, internal energy, U, and statement of first law; enthalpy, H, relation between heat capacities, calculations of q, w, U and H for reversible, irreversible and free expansion of gases (ideal and van der Waals) under isothermal and adiabatic conditions. Heats of reactions: standard states; enthalpy of formation of molecules and ions and enthalpy of combustion and its applications; calculation of bond energy. Second Law:

Concept of entropy; thermodynamic scale of temperature, statement of the second law of thermodynamics; molecular and statistical interpretation of entropy. Calculation of entropy change for reversible and irreversible processes. Third Law: Statement of third law, concept of residual entropy, calculation of absolute entropy of molecules. Free Energy Functions: Gibbs and Helmholtz energy; variation of S, G, A with T, V, P; Free energy change and spontaneity. Relation between Joule-Thomson coefficient and other thermodynamic parameters; inversion temperature. Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices. Ionization of weak acids and bases, pH scale, common ion effect, Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions; derivation of Henderson equation and its applications; buffer capacity, buffer range. Kinetic molecular model of a gas: postulates and derivation of the kinetic gas equation; collision frequency. Maxwell distribution and its use in evaluating molecular velocities (average, root mean square and most probable) and average kinetic energy. Order and molecularity of a reaction, rate laws in terms of the advancement of a reaction, differential and integrated form of rate expressions up to second order reactions, experimental methods of the determination of rate laws, kinetics of complex reactions.

ORGANIC CHEMISTRY

Homolytic and Heterolytic fission with suitable examples. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Nucleophlicity and basicity; Types, shape and their relative stability of Carbocations, Carbanions, Free radicals and Carbenes. Introduction to types of organic reactions and their mechanism: Addition, Elimination and Substitution reactions. Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions; Geometrical isomerism: cis–trans and, syn-anti isomerism E/Z notations with C.I.P rules. Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two or more chiral-centres, Distereoisomers, meso structures, Racemic mixture and resolution. Relative and absolute configuration: D/L and R/S designations

PHYSICS

Basics of classical mechanics; Laws of motion; Planck's theory, de Broglies's hypothesis, The Harmonic Oscillator: Schrodinger approach; Hydrogenic Atoms: Orbitals. Free electron gas in one and three dimensions. Thermionic emission, work function, electrical conductivity of the free electron gas Energy Bands: Fermi-Dirac Statistics; Holes; Effective Mass; Density of States:3D, 2D, 1D; Conduction & Valence Bands; Electrons in periodic potential, Origin of energy bands in solids, classification of solids as metals , insulators and semiconductors on the basis of the band picture, Origin of the energy gap (qualitative discussions). Temperature dependence of Fermi energy. Crystal structure, Packing fraction, specific surface energy and surface stress, effect on the lattice parameter, Bragg's law of diffraction, Size and shape dependent optical, emission, electronic transport, refractive index, dielectric, mechanical, magnetic; quantum confinement in semiconductors; Mechanical properties – Stress and Strain concept, Elastic properties, General Optics and Optical properties - refraction, reflection, Absorption, Transmission, luminescence, Magnetic properties - paramagnetism -

ferromagnetism - domain theory - magnetic hysteresis, – antiferromagnetism. Basics of Themodynamics, Laws of thermodynamics and related applications, Concepts of free energy and entropy. Semiconductor Physics; Energy Band Diagram: Electron Energy Bands, Dopant Atoms and Energy Levels, Position of Fermi Energy Level, Solid state phase transformations, excitons, band-gap variations-quantum confinement, Charge Carriers in Semiconductors: Intrinsic and Extrinsic Semiconductors, Carrier Transport Phenomena: Carrier Drift, Carrier Diffusion, Hall Effect. Semiconductor Electronic devices: p-n Junction, p-n Junction Diode, Metal-Semiconductor and Semiconductor Heterojunctions, Bipolar Transistor, Concept of direct and indirect band gap in semiconductors.

BIOLOGICAL SCIENCES

Evolution and origin of life, biological classification systems

Plant anatomy and physiology: plant tissues, hormones, mineral nutrition, biofertilizers and pesticides

Animal anatomy and physiology: animal tissues, blood, digestive system, respiratory system, excretion system, nervous system, endocrine system, reproduction system, skeleton system.

Cytology and molecular biology: Cell and cell organelles, cell cycle, cell division-Mitosis and meiosis, DNA, RNA, DNA replication, translation, transcription, DNA repair mechanism.

Biochemistry: Basic structures and functions of amino acids, carbohydrates, lipids, proteins. Enzymes. Kidney and liver function tests.

Ecology: Ecosystem, ecological pyramids, environment pollution and green house effects.

Immunology: Basics of immunology, antigens, antibody, antigen-antibody interactions, types of immunity, immunological disorders, hypersensitivity reactions, monoclonal antibodies, and immunization.

Microbiology: Classification of pathogens, Gram staining, diseases and treatments.

Genetics: Mendelian genetics, genetic disorders, and gene therapy.

Biotechnology: Molecular biology techniques including DNA transformation techniques, types of vectors, cloning and expression. Restriction enzymes, types of polymeric chain reactions (PCR), and gel electrophoresis.

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PGQP51

Entrance Test for the Course(s): M.Sc. (Sports Physiology) [CURAJ] (Sports Nutrition) [CURAJ] (Sports Biochemistry) [CURAJ], (Sports Biomechanics) [CURAJ]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

General Biology: Cell: Structure and Function, Cell organelles, Cell cycle and Cell Division, Biomolecules, DNA structure and Replication, Enzymes, Glycolysis and TCA cycle, Genetics and Evolution, Principles of Inheritance and variation, Human health and diseases. Microbes, Biotechnology and its application, Immune system, Digestion and Absorption, Circulatory system, Respiratory system in humans, Musculoskeletal system, Skeletal muscle and its functions, muscle contraction, Neural control and coordination, Ecosystem, Basic concept of Food and Nutrition, Macronutrients and micronutrients, Nutrient deficiencies, Water, hydration and health.

Biochemistry: Structure and Function of Carbohydrate, Protein, Nucleic acid, Fatty acids, Lipids and Enzymes, Bioenergetics, Glycolysis, Gluconeogenesis, Pentose Phosphate Pathway, Citric Acid Cycle, Electron Transfer System, Oxidative Phosphorylation; Metabolic Regulation of Glucose and Glycogen, Lipid Biosynthesis, Fatty Acids Catabolism, Biosynthesis, Oxidation and Production of Urea, linkage & crossing over, chromosomal aberrations, mutation, extra chromosomal inheritance, replication, transcription, translation, DNA repair, transformation, transduction.

Human Physiology: Cellular Physiology; Exercise and Energy Metabolism; Macronutrients, micronutrients and water, Basic energy systems and their functions, Drugs and doping; Blood, Body fluids and Endocrinology; Exercise and Muscular system: Classification of muscle, Physiological anatomy of skeletal muscle, Motor unit and All-or-none law, Muscular adaptations in response to training; Exercise and Cardiovascular system: Basic anatomy of heart and vessels, Cardiac output and cardiac cycle; Exercise and Respiratory system: Physiological anatomy of respiratory system, Internal and external respiration; Exercise and Nervous system: Nervous system types, components and their functions, Structure, types and functions of neuron, Synaptic junction; Exercise and Thermoregulation; Hypo- and hyperthermia, Mechanisms of heat exchange.

Food and Nutrition: Food groups and RDA, Functions, metabolism, sources and deficiency of nutrients, water, energy, CHO, proteins, fats, vitamins and minerals. Cereals and millets, Legumes and oil seeds, Fruits and vegetables, Flesh foods and Eggs, Milk and milk products, Sugar and jiggery, Fats and oils. Etiology, symptoms, and dietary management in diseases of the gastrointestinal tract, metabolic disorders, kidney diseases, diseases of cardiovascular system, diet for weight management, diet for allergic conditions. Introduction to quality control, evaluation and assurance, organization of quality control department; Food laws and standards, control of food quality, evaluation of food safety. Food adulteration- classification & detection methods of adulterants Hygiene and sanitation- issue in food safety, potable water, cleaning and

washing, cleaning agents, personal hygiene of the food handlers, food contamination and its hazards.

Mechanics: Scalar and Vector, Force, Momentum, velocity work, momentum, projectile motion, gravitation, circular motion, rotational motion, Simple harmonic motion, Sound waves, potential and kinetic energy, conservation of energy, Elasticity, Angular Momentum, Moment of Inertia, Radius of gyration.

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PGQP52

Entrance Test for the Course(s): M.Tech. (Microelectronics & VLSI) [CUASM]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Section 1: Engineering Mathematics
Linear Algebra: Vector space, basis, linear dependence and independence, matrix algebra, eigenvalues and eigenvectors, rank, solution of linear equations- existence and uniqueness.

Calculus: Mean value theorems, theorems of integral calculus, evaluation of definite and improper integrals, partial derivatives, maxima and minima, multiple integrals, line, surface and volume integrals, Taylor series.

Differential Equations: First order equations (linear and nonlinear), higher order linear differential equations, Cauchy's and Euler's equations, methods of solution using variation of parameters, complementary function and particular integral, partial differential equations, variable separable method, initial and boundary value problems.

Vector Analysis: Vectors in plane and space, vector operations, gradient, divergence and curl, Gauss's, Green's and Stokes' theorems.

Complex Analysis: Analytic functions, Cauchy's integral theorem, Cauchy's integral formula, sequences, series, convergence tests, Taylor and Laurent series, residue theorem.

Probability and Statistics: Mean, median, mode, standard deviation, combinatorial probability, probability distributions, binomial distribution, Poisson distribution, exponential distribution, normal distribution, joint and conditional probability.

Section 2: Networks, Signals and Systems
Circuit analysis: Node and mesh analysis, superposition, Thevenin's theorem, Norton's theorem, reciprocity.

Sinusoidal steady state analysis: phasors, complex power, maximum power transfer. Time and frequency domain analysis of linear circuits: RL, RC and RLC circuits, solution of network equations using Laplace transform.

Linear 2-port network parameters, wye-delta transformation.

Continuous-time signals: Fourier series and Fourier transform, sampling theorem and applications.

Discrete-time signals: DTFT, DFT, z-transform, discrete-time processing of continuous-time signals. LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeroes, frequency response, group delay, phase delay.

Section 3: Electronic Devices

Energy bands in intrinsic and extrinsic semiconductors, equilibrium carrier concentration, direct and indirect band-gap semiconductors.

Carrier transport: diffusion current, drift current, mobility and resistivity, generation and recombination of carriers, Poisson and continuity equations.

P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED, photo diode and solar cell.

Section 4: Analog Circuits

Diode circuits: clipping, clamping and rectifiers.

BJT and MOSFET amplifiers: biasing, ac coupling, small signal analysis, frequency response. Current mirrors and differential amplifiers.

Op-amp circuits: Amplifiers, summers, differentiators, integrators, active filters, Schmitt triggers and oscillators.

Section 5: Digital Circuits

Number representations: binary, integer and floating-point- numbers.

Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders.

Sequential circuits: latches and flip-flops, counters, shift-registers, finite state machines, propagation delay, setup and hold time, critical path delay.

Data converters: sample and hold circuits, ADCs and DACs.

Semiconductor memories: ROM, SRAM, DRAM.

Computer organization: Machine instructions and addressing modes, ALU, data-path and control unit, instruction pipelining.

Section 6: Control Systems

Basic control system components; Feedback principle; Transfer function; Block diagram representation; Signal flow graph; Transient and steady-state analysis of LTI systems; Frequency response; Routh-Hurwitz and Nyquist stability criteria; Bode and root-locus plots; Lag, lead and lag-lead compensation; State variable model and solution of state equation of LTI systems.

Section 7: Communications

Random processes: autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI systems.

Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers.

Information theory: entropy, mutual information and channel capacity theorem.

Digital communications: PCM, DPCM, digital modulation schemes (ASK, PSK, FSK, QAM), bandwidth, inter-symbol interference, MAP, ML detection, matched filter receiver, SNR and BER.

Fundamentals of error correction, Hamming codes, CRC.

Section 8: Electromagnetics

Maxwell's equations: differential and integral forms and their interpretation, boundary conditions,wave equation, Poynting vector.

Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth.

Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart.

Rectangular and circular waveguides, light propagation in optical fibers, dipole and monopole antennas, linear antenna arrays.

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PGQP53

Entrance Test for the Course(s): M.Tech. (Embedded and Real Time Systems) [CUKNK]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

OVERVIEW OF MICROCONTROLLERS

Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.

INTRODUCTION TO EMBEDDED SYSTEMS

Embedded systems over view, Design challenges, Processor technology, IC technology, and design technology. Embedded Vs General computing system, Classification of Embedded systems, Major applications and purpose of ES. Core of an Embedded System including all types of processor/controller.

INTRODUCTION TO REAL-TIME SYSTEMS

Historical background, Elements of a Computer Control System, RTS- Definition, Classification of Real-time Systems, Time Constraints, Classification of Programs. Computer Hardware Requirements for Real-Time Applications: Introduction, General Purpose Computer, Single Chip Microcomputers and Microcontrollers, Specialized Processors, Process- Related Interfaces, Data Transfer Techniques, Communications, Standard Interface.

EMBEDDED COMPUTING AND ARM PROCESSORS

Complex systems and microprocessors– Embedded system design process –Design example: Model train controller- Instruction sets preliminaries – ARM Processor – CPU: programming input and output- supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption.

EMBEDDED COMPUTING PLATFORM DESIGN

The CPU Bus-Memory devices and systems–Designing with computing platforms – consumer electronics architecture – platform-level performance analysis – Components for embedded programs.

PGQP54

Entrance Test for the Course(s): M.Tech. (Computer Science & Technology (Cyber Security)) [CUPUN], (Computer Science & Technology) [CUJHD], [CUPUN], [CUJAM], (Computer Science & Engg.) [CURAJ], [CUASM], (Computer Science (Cyber-Physical Systems)) [CURAJ], (Artificial Intelligence and Data Science) [CUAPH]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Engineering Mathematics

1. **Theory of Probability:** Axiomatic definition of Probability, Conditional Probability Baye's Theorem, Random Variables Functions of random variables; Probability distributions: Binomial Poisson, Exponential and Normal distribution and their moment generating functions.
2. **Set Theory & Algebra:** Sets; Relations; Functions; Composition of function and relations, Groups; Partial Orders; Boolean Algebra.
3. **Combinatorics:** Permutations; Permutations with and without repetition; Combinations; generating functions; recurrence relations.
4. **Graph and Trees:** Introduction to graphs, Directed and Undirected graphs, Homomorphic and Isomorphic graphs, Subgraphs, Cut points and Bridges, Multigraph and Weighted graph, Paths and circuits, Shortest path in weighted graphs, Eurelian path and circuits, Hamilton paths and circuits, Planar graphs, Eulers' formula, Trees, Spanning trees.
5. **Linear Algebra:** Algebra of matrices, determinants, systems of linear equations, Eigen values and Eigen vectors.
6. **Calculus:** Limit, Continuity & differentiability, Mean value Theorems, Theorems of integral calculus, evaluation of definite & improper integrals, Partial derivatives, Total derivatives, maxima & minima.
7. **Theory of Computation:** Finite Automata and Regular Expressions, Non-determinism and NFA, Properties of Regular Sets, Context free grammar: Chomsky Normal Form (CNF), Griebach Normal Form (GNF), Push-down automata, Moore and mealy Machines, Turing machines,
8. **Digital Logic:** Number representation and computer arithmetic (fixed and floating point), Logic functions, Minimization, Design and synthesis of combinational and sequential circuits, A/D AND D/A CONVERTERS.
9. **Computer Organization and Architecture:** Machine instructions and addressing modes, ALU and data-path, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage.
10. **Microprocessors and Interfacing:** instruction set, Addressing modes, Memory interfacing, Interfacing peripheral devices, Interrupts. Microprocessor architecture,

Instruction set and Programming (8085), Microprocessor applications, DMA, Interrupt and Timer.

11. **Programming and Data Structures:** Programming in C; Functions, Recursion, Parameter passing, Definition of data structure. Arrays, stacks, queues, linked lists, trees, priority queues and heaps, Binary search trees.
12. **Algorithms:** Algorithm concepts, Analyzing and design, asymptotic notations and their properties, Worst and average case analysis; Design: Greedy approach, Dynamic programming, Divide-and- conquer; Tree and graph traversals, Spanning trees, Shortest paths; Hashing, Sorting, Searching.
13. **Compiler Design:** Assemblers, linkers, loaders, compilers and translators, the structure of a compiler, different states in the construction of a compiler, Lexical analysis, Parsing, Syntax directed translation, Runtime environments, Intermediate and target code generation, Basics of code optimization.
14. **Operating System:** Main functions of operating systems, Processes, Threads, Inter-process communication, Concurrency, Synchronization, Deadlock, CPU scheduling, I/O scheduling, Resource scheduling. Deadlock and scheduling algorithms, Banker's algorithm for deadlock handling. Memory management and virtual memory, File systems, I/O systems, DOS, UNIX and windows.
15. **Databases:** Database Concepts, ER-model, Data Models, Relational model (relational algebra, tuple calculus), RAID, Database design (integrity constraints), Normalization (up to 4th Normal forms), BCNF (Boyce code normal forms), Query languages (SQL), Data mining & data warehousing, Transactions and concurrency control, Database security: Database security issues, Discretionary access control, Mandatory & role based access control, Database audit.
16. **Computer Networks:** OSI model, TCP/IP model, LAN technologies (Ethernet, Token ring), Transmission media - twisted pair, coaxial cables, fibre-optic cables, Flow and error control techniques, Routing algorithms, Congestion control, IP(v4), Application layer protocols (icmp, dns, smtp, pop, ftp, http); sliding window protocols; Internetworking: Switch/Hub, Bridge, Router, Gateways, Concatenated virtual circuits, Firewalls; Network Security: Cryptography - public key, secret key. Domain Name System (DNS) - Electronic Mail and World wide Web (WWW).

Web technologies: HTML, XML, basic concepts of client-server computing

PGQP55

Entrance Test for the Course(s): M.Tech. (Material Science and Technology) [CUTND], (Nanotechnology) [CUJHD]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:
Crystal structure, Different types of bonding: ionic, covalent, metallic and van der Wall's. Lattice energy - Madelung constants – Born Haber cycle – cohesive energy. Quantum states-binding energy-interatomic spacing - variation in bonding characteristics – Single crystals – polycrystalline - Non crystalline solids - Imperfection in solids – Vacancies – Interstitials. Equilibrium thermodynamics, Phase equilibria, Phase transformations

Crystalline and amorphous solids, primitive and unit cells, Bravais lattices, crystal structure, lattice and basis. Packing factors – cubic, hexagonal, diamond structures Lattice translation operation. Elementary idea of point symmetry operations (inversion centre, rotation and reflection symmetry). Primitive translation vectors, lattice planes – Miller indices for designating crystal planes. Inter-planar distances – directions. Reciprocal lattice. Volume of a primitive cell in the reciprocal space. Geometrical interpretation of the Bragg equation in the reciprocal space. Structural characterization Basic principles of X-ray diffraction spectroscopy.

Law of thermodynamics and related applications, Concepts of free energy and entropy, Mechanical properties - Stress, Strain, Elastic properties Optical properties - refraction, reflection, Absorption, Transmission, Insulators, luminescence - Magnetic properties - paramagnetism - ferromagnetism - domain theory – magnetic hysteresis, – antiferromagnetism.

Free electron gas in one and three dimentions. Thermionic emission , work function, electrical conductivity of the free electron gas: Drude Lorentz Model, Sommerfield's quantum theory.the heat- capacity of the conduction electrons (Electron Specific heat) Widemann-Franz law and its validity. Metallic conduction, Energy bands, Brillouin zones, Temperature dependence of metallic conductivity – carrier concentrations in intrinsic, extrinsic semiconductors – Impurity contributions, Doping effects, Law of mass action. Fermi level - variation of conductivity, mobility with temperature

Electrons in periodic potential, Origin of energy bands in solids, classification of solids as metals, insulators and semiconductors on the basis of the band picture, Origin of the energy gap (qualitative discussions). Bloch's theorem in one dimension, nearly free electron approximation - formation of energy bands and gaps – Brillouin zones and boundaries - the Kronig-Penney model. E-K diagram, reduced zone representation, Brillouin zone, concept of effective mass and holes, Fermi- Dirac distribution function, Density of states for electrons in band. Temperature dependence of Fermi energy.

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering- Classification of nanostructures, nanoscale architecture – Effects of the nanometre length scale - surface to volume ratio – Effect of nanoscale dimensions on various properties – Structural, thermal, chemical, mechanical, magnetic, optical and electronic

properties – effect of nanoscale dimensions on biological systems. Structure of nanomaterials - comparison with conventional materials.

Top down and bottom up synthesis approach, physical and chemical techniques for nanomaterial synthesis.

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PGQP56

Entrance Test for the Course(s): M.Tech. (Aquacultural Engg.) [CUASM], (Water Resource Development & Management) [CUASM], (Farm Machinery & Power Engg.) [CUASM], (Food Processing Engg.) [CUASM]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Engineering Mathematics

Linear Algebra: Matrices and determinants, linear and orthogonal transformations, Caley-Hamilton theorem; Eigenvalues and Eigenvectors, solutions of linear equations.
Calculus: Limit, continuity and differentiability; partial derivatives; homogeneous function – Euler's theorem on homogeneous functions, total differentiation; maxima and minima of function with several independent variables; sequences and series – infinite series, tests for convergence; Fourier, Taylor and MacLaurin series.
Vector Calculus: Vector differentiation, scalar and vector point functions, vector differential operators – del, gradient; divergence and curl; physical interpretations-line, surface and volume integrals; Stokes, Gauss and Green's theorems.
Differential Equations: Linear and non-linear first order Ordinary Differential Equations (ODE); homogeneous differential equations, higher order linear ODEs with constant coefficients; Laplace transforms and their inverse; Partial Differential Equations - Laplace, heat and wave equations.
Probability and Statistics: Mean, median, mode and standard deviation; random variables; Poisson, normal and binomial distributions; correlation and regression analysis.
Numerical Methods: Solutions of linear and non-linear algebraic equations; numerical integration - trapezoidal and Simpson's rule; numerical solutions of ODEs.

Farm Machinery

Machine Design: Design and selection of machine elements – gears, pulleys, chains and sprockets and belts; overload safety devices used in farm machinery; measurement of force, stress, torque, speed, displacement and acceleration on machine elements - shafts, couplings, keys, bearings and knuckle joints.
Farm Machinery: Soil tillage; forces acting on a tillage tool; hitch systems and hitching of tillage implements; functional requirements, principles of working, construction and operation of manual, animal and power operated equipment for tillage, sowing, planting, fertilizer application, inter-cultivation, spraying, mowing, chaff cutting, harvesting and threshing calculation of performance parameters - field capacity, efficiency, application rate and losses; cost analysis of implements and tractors.

Farm Power

Sources of Power: Sources of power on the farm - human, animal, mechanical, electrical, wind, solar and biomass; bio-fuels.

Farm Power: Thermodynamic principles of I.C. engines; I.C. engine cycles; engine components; fuels and combustion; lubricants and their properties; I.C. engine systems – fuel, cooling, lubrication, ignition, electrical, intake and exhaust; selection, operation, maintenance and repair of I.C. engines; power efficiencies and measurement; calculation of power, torque, fuel consumption, heat load and power losses; performance index, cost analysis of implements and tractors.
Tractors and Power tillers: Type, selection, maintenance and repair of tractors and power tillers; tractor clutches and brakes; power transmission systems – gear trains, differential, final drives and power take-off; mechanics of tractor chassis; traction theory; three point hitches - free link and restrained link operations; steering and hydraulic control systems used in tractors; tractor tests and performance; human engineering and safety considerations in design of tractor and agricultural implements.

Soil and Water Conservation Engineering
Fluid Mechanics: Ideal and real fluids, properties of fluids; hydrostatic pressure and its measurement; continuity equation, kinematics and dynamics of flow; Bernoulli's theorem; laminar and turbulent flow in pipes, Darcy- Weisbach and Hazen-Williams equations, Moody's diagram; flow through orifices, weirs and notches; flow in open channels, dimensional analysis – concepts of geometric dimensionless numbers.
Soil Mechanics: Engineering properties of soils; fundamental definitions and relationships; index properties of soils; permeability and seepage analysis; shear strength, Mohr's circle of stress, active and passive earth pressures; stability of slopes, Terzaghi's one dimensional soil consolidation theory.

Agricultural Engineering
Hydrology: Hydrological cycle and measurement of its components; meteorological parameters and their measurement; analysis of precipitation data; runoff estimation; hydrograph analysis, unit hydrograph theory and application; streamflow measurement; flood routing, hydrological reservoir and channel routing, Infiltration – indices and equations, drought and its classification.
Surveying and Leveling: Measurement of distance and area; instruments for surveying and leveling; chain surveying, methods of traversing; measurement of angles and bearings, plane table surveying; types of leveling; theodolite traversing; contouring; total station, introduction to GPS survey, computation of areas and volume.
Soil and Water Erosion: Mechanics of soil erosion - wind and water erosion: soil erosion types, factors affecting erosion; soil loss estimation; biological and engineering measures to control erosion; terraces and bunds; vegetative waterways; gully control structures, drop, drop inlet and chute spillways; earthen dams.
Watershed Management: Watershed characterization and land use capability classification; water budgeting in watershed, rainwater harvesting, check dams and farm ponds.

Irrigation and Drainage Engineering
Soil-Water-Plant Relationship: Water requirement of crops; consumptive use and evapotranspiration; measurement of infiltration, soil moisture and irrigation water infiltration.
Irrigation Water Conveyance and Application Methods: Design of irrigation channels and underground pipelines; irrigation scheduling; surface, sprinkler and micro irrigation methods, design and evaluation of irrigation methods; irrigation efficiencies.

Agricultural Drainage: Drainage coefficient; planning, design and layout of surface and sub-surface drainage systems; leaching requirement and salinity control; irrigation and drainage water quality and reuse; non-conventional drainage system.
Groundwater Hydrology: Groundwater occurrence; Darcy's Law, steady and unsteady flow in confined and unconfined aquifers, groundwater exploration techniques; overview of groundwater recharge estimation and artificial recharge techniques.
Wells and Pumps: Types of wells, steady flow through wells; design and construction of water wells; classification of pumps; pump characteristics; pump selection and installation.

Agricultural Process Engineering
Engineering properties of agriculture produce: Physical, thermal, frictional, rheological and electrical properties.
Evaporation and Drying: Concentration and drying of liquid foods – evaporators, tray, drum and spray dryers; hydrothermal treatments; drying and milling of cereals, pulses and oilseeds; drying kinetics; psychrometry – properties of air-water vapor mixture.
Size Reduction and Material Handling: Mechanics and energy requirement in size reduction of agriculture produce; particle size analysis for comminuted solids; size separation by screening; fluidization of granular solids-pneumatic, bucket, screw and belt conveying; cleaning and grading; effectiveness of separation; centrifugal separation of solids, liquids and gases; homogenization; filtration and membrane separation.
Processing of Agriculture Produce: Processing of seeds, spices, fruits and vegetables; value addition of agriculture produce.
Storage Systems: Controlled and modified atmosphere storage; perishable food storage, godowns, bins and grain silos, packaging material and machines.

Dairy and Food Engineering
Heat and Mass Transfer: Steady state heat transfer in conduction, convection and radiation; transient heat transfer in simple geometry; working principles of heat exchangers; diffusive and convective mass transfer; simultaneous heat and mass transfer in agricultural processing operations; material and energy balances in food processing systems; water activity, sorption and desorption isotherms.
Preservation of Food: Kinetics of microbial death – pasteurization and sterilization of milk and other liquid foods; preservation of food by cooling and freezing; refrigeration and cold storage basics and applications

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PGQP57

Entrance Test for the Course(s): M.Tech. (Water Engg. & Management) [CUJHD]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, general awareness/knowledge, numerical ability.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

Fluid Mechanics:

Types of fluids, Properties of Fluids, Equation of state, Coefficient of compressibility, Bulk modulus of elasticity, Newtonian and non- Newtonian fluid, Coefficient of thermal expansion, Surface tension, capillarity, concept of viscosity, Effect of temperature on viscosity. Fluid Static, Fluid Kinematics, Fluid Rotation, Fluid dynamics. Dimensional and Model Analysis, Laminar flow, Turbulent Flow. Cement, Concrete, Special Concrete, Properties of bricks and stones, forms of bricks, tests on bricks and stones, relevant codes, Timber.

Physical properties of Rock forming Minerals, introduction of Rocks, mode of formation and classification of sedimentary and igneous rocks, agents of metamorphism and zone of metamorphism, physical and engineering properties of some important rocks, Weathering; mechanical and chemical weathering: Erosion.

Surveying and Levelling:

Plane and geodetic surveying; classification of surveying; basic principles; measurement of horizontal distance by conventional methods; taping on sloping ground, offsets, errors and sources of errors, field book. Levelling: definition of terms; levelling principle; levelling, instruments; types of spirit levelling; methods of booking and reduction of levels; sensitiveness of level tube; errors in levelling; curvature and refraction correction. Compass Survey, Plane Table Surveying, Area and Volume Computation: computation of area by different methods.

Mechanics of Solids:

Theories of Elastic Failure: Introduction; Comparison and Significance of Various Theories, Distribution of Bending and Shear Stresses across cross-section of Beams; Shear Centre; Theory of

Shear Flow; Shear Flow Diagrams; Shear Centre for Thin-Walled Symmetrical Sections, Basic Elastic Theorems and Energy Methods; Theorem of Complementary Energy; Principle of Minimum Strain Energy; Concepts of Stiffness and Flexibility.

Functions of Project Management, Project Life Cycle, the Project Environment, Project Selection, Project Proposal, Project Scope, Work Breakdown Structure. Network Scheduling, Critical Path Method, Program Evaluation & Review Technique, Planning and Scheduling of Activity Networks, Assumptions in PERT Modelling, Time-cost Trade-offs, Linear Programming and Network Flow Formulations, PERT/COST Accounting.

Hydrology:

Hydrological cycle, storage, water balance. Atmospheric Circulation: Atmospheric circulation patterns, cyclones, typhoons, water vapor, precipitable water. Hydrologic Elements: Precipitation types, measurements, analysis, mean precipitation, depth-areaduration relation, and maximum intensity duration-frequency relation. Evapotranspiration: Evaporation processes, influencing factors, measurement, potential and actual evapotranspiration. Infiltration: Infiltration processes, influencing factors, measurement, and infiltration models, infiltration capacity.

Geotechnical Engineering: Nature of Soil, Phase Representation and Relationships, Structure of soil; soil texture; Size and range of soil particles; shapes of individual sand and clay particles; field identification of soils; Introduction to particulate behaviour. Three-phase system : representation by Phase diagram – soil solids, water and air; Basic definitions and relationships : Specific gravity; Void ratio; Porosity; water content; Unit Weights : bulk, dry, saturated, submerged and natural; Degree of saturation and Density index. Nature of Soil, Phase Representation and Relationships, Structure of soil; soil texture; Size and range of soil particles; shapes of individual sand and clay particles; field identification of soils; Introduction to particulate behaviour. Three-phase system: representation by Phase diagram

– soil solids, water and air; Basic definitions and relationships : Specific gravity; Void ratio; Porosity; water content; Unit Weights : bulk, dry, saturated, submerged and natural; Degree of saturation and Density index. Compaction, Consolidation and Shear Strength of Soil. Bearing Capacity of Shallow and Deep Foundations.

Irrigation Engineering and Hydraulic Structures: Irrigation Development Planning, Irrigation Network and Hydraulics, Planning and Design of Irrigation Systems, Kenneady and Lacey's theory, Wastewater Quantity Estimation, Wastewater Quality Enhancement, Physical Unit Processes: Screening, Introduction to Microbiology, Basic Features of Open Channel Flow, Uniform Flow, Critical flow, Specific Energy, Hydraulic Jump. Fundamentals of Groundwater Flow and Groundwater Wells, Groundwater Resources Assessment, Introduction to watershed hydrology.

PGQP58

Entrance Test for the Course(s): M.Tech. (Power & Energy Engg.) [CUKNK]

1. PART-A will consist of **25 objective questions** (MCQs) and will include English, General Awareness, Mathematical Aptitude and Analytical Skills.

2. PART-B will consist of **75 objective questions** (MCQs) from the following syllabus:

i. Basics of energy and
ii. Relevant topics from mechanical/ electrical/ electronics/ chemical engineering, and Physics and Chemistry.