NEET Important Questions with Solutions from Electronic Devices

Q.1. For common emitter transistor amplifier, the audio signal voltage across the collector resistance of $2\ \mathrm{k\Omega}$ is $4\ \mathrm{V}$. If the current amplification factor of the transistor is 100 and the base resistance is $1\ \mathrm{k\Omega}$ then the input signal voltage is

A) $10\ \mathrm{mV}$

B) $20\ \mathrm{mV}$

C) $30\ \mathrm{mV}$

D) $15\ \mathrm{mV}$

Answer: $20\ \mathrm{mV}$

Solution: $R_C = 2\ \mathrm{k\Omega} \quad V_0 = 4\ \mathrm{V}$

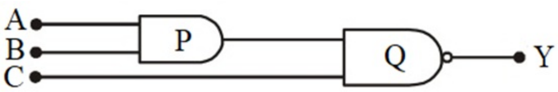
$I_C = \frac{V_0}{R_c} = \frac{4\ \mathrm{V}}{2\ \mathrm{k\Omega}} = 2\ \mathrm{mA}$

$\beta = \frac{I_C}{I_B} = 100$

$\Rightarrow I_B = \frac{I_C}{100} = 2 \times 10^{-5}\ \mathrm{A}$

$V_{in} = I_B R_i = 2 \times 10^{-5} \times 1\ \mathrm{k\Omega} = 20\ \mathrm{mV}$

Q.2. What is the output Y in the following circuit, when, all the three inputs A, B, C are first 0 and then, 1?



A) $0, 1$

B) $0, 0$

C) $1, 0$

D) $1, 1$

Answer: $1, 0$

Solution: Output, $Y = \overline{(A \cdot B) \cdot C} = \overline{A} + \overline{B} + \overline{C}$.

When, $A,\ B,\ C$ are $0 \rightarrow \mathrm{Y} = 1$.

When, $A,\ B,\ C$ are $1 \rightarrow \mathrm{Y} = 0$.

Q.3. A NPN transistor is connected in common emitter configuration in a given amplifier. A load resistance of $800\ \Omega$ is connected in the collector circuit and the voltage drop across it is $0.8\ \mathrm{V}$. If the current amplification factor is 0.96 and the input resistance of the circuit is $192\ \Omega$, the voltage gain and the power gain of the amplifier will respectively be:

A) $4, 3.84$

B) $3.69, 3.84$

C) $4, 4$

D) $4, 3.96$

Answer: $4, 3.84$

Solution: Given,

The value of the load resistance is $800\ \Omega$.

Voltage drop across the load resistance is, $0.8\ \mathrm{V}$

Voltage gain $= \beta.\left(\frac{R_C}{R_B}\right)$

$V = 0.96\left(\frac{80}{192}\right)$

$V = \frac{96\times8}{192} = 4$

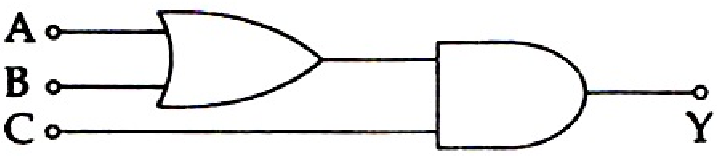
And power gain of the amplifier is given by,

$\beta_{ac}.A_v$

$= 0.96 \times 4$

$= 3.84$

Q.4. To get output 1 for the following circuit, the correct choice for the input is:



A) $A = 0,\ B = 1,\ C = 0$

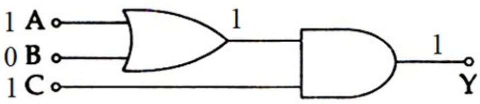
B) $A = 1,\ B = 0,\ C = 0$

C) $A = 1,\ B = 1,\ C = 0$

D) $A = 1,\ B = 0,\ C = 1$

Answer: $A = 1,\ B = 0,\ C = 1$

Solution:



Q.5. The input signal is given to a CE amplifier having a voltage gain of 150 is $V_i = 2\cos\left(15t + \frac{\pi}{3}\right)$. The corresponding output signal will be:

A) $75\cos\left(15t + \frac{2\pi}{3}\right)$

B) $2\cos\left(15t + \frac{5\pi}{6}\right)$

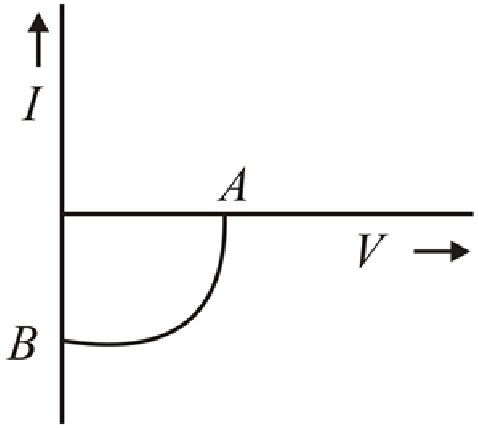
C) $300\cos\left(15t + \frac{4\pi}{3}\right)$

D) $300 \cos \left(15 \mathrm{t}+\frac{\pi}{3}\right)$

Answer: $300 \cos \left(15 \mathrm{t}+\frac{4 \pi}{3}\right)$

Solution: CE amplifier causes phase difference of $\pi(=180^{\circ})$ so $\mathrm{V}_{\text {out }}=300 \cos \left(15 \mathrm{t}+\frac{\pi}{3}+\pi\right)$

Q.6. The given graph represents V - I characteristic for a semiconductor device.



Which of the following statement is correct?

A) It is V - I characteristic for solar cell where, point A represents open circuit voltage and point B short circuit current

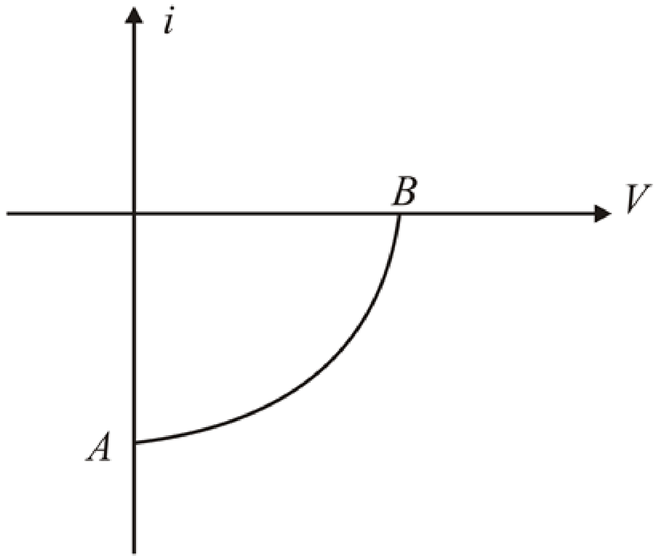
B) It is for a solar cell and points A and B represent open circuit voltage and current, respectively

C) It is for a photodiode and points A and B represent open circuit voltage and current respectively

D) It is for a LED and points A and B represent open circuit voltage and short circuit current, respectively

Answer: It is V - I characteristic for solar cell where, point A represents open circuit voltage and point B short circuit current

Solution:



The given graph is V - I characteristic curve for a solar cell, where A i.e point where $\mathrm{V}=0$ represents open circuit voltage of solar cell and B i.e. the point where $\mathrm{i}=0$ represents short circuit current.

Q.7. The barrier potential of a p-n junction depends on:
(a) type of semi-conductor material
(b) amount of doping
(c) temperature
Which one of the following is correct?

A) (a) and (b) only

B) (b) only

C) (b) and (c) only

D) $(a),\ (b)$ and (c)

Answer: $(a),\ (b)$ and (c)

Solution: The barrier potential in a p-n junction diode is a barrier which to be overcome by additional force in order to cross.

The barrier potential depends on various factors.

Different semiconductor material will have different barrier potential for the same amount of doping thus it depends on the type of semiconductor material.

For same semiconductor it is observed that for different amount of doping barrier potential is different.

For same semiconductor barrier potential changes with temperature thus barrier potential also depends on the temperature.

The barrier potential depends on type of semiconductor (for $Si\ V_b=0.7$ volt and for $Ge\ V_b=0.3$ volt), amount of doping and also on the temperature.

Q.8. The formation of band structure in solids is explained by

A) Heisenberg's uncertainty principle.

B) Pauli's exclusion principle.

C) Bohr's correspondence principle.

D) Boltzmann law.

Answer: Pauli's exclusion principle.

Solution: According to Pauli's exclusion principle, the electronic configuration of the number of subshells existing in a shell and the number of electrons entering each subshell can be found.
Hence, based on this principle, the manifestation of the band structure in solids can be explained.

Q.9. Avalanche breakdown is primarily dependent on the phenomenon of

A) collision.

B) ionisation.

C) doping.

D) recombination.

Answer: collision.

Solution: As we increase the reverse potential, electric field across the junction will also keep on increasing. Due to this electron will experience a force on them, and they will break free from the covalent bond. These electrons now accelerate and collide with the electrons of other atoms and create further electron hole pairs. These electrons will start drifting and electron hole pair recombination takes place across the junction. This causes breakdown of junction barrier and is termed as avalanche breakdown.

Q.10. Zener diode is used as

A) half wave rectifier.

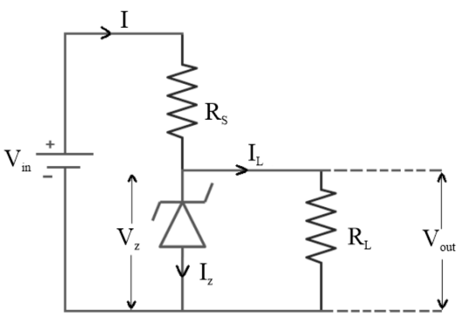
B) full wave rectifier.

C) AC voltage stabilizer.

D) DC voltage stabilizer

Answer: DC voltage stabilizer

Solution:



In reverse bias, zener diode allows various values of current at constant zener voltage.
Current through series resistor is, $I=\frac{V_{in}-V_z}{R_s}$
Current through the load resistor is, $I_L=\frac{V_{out}}{R_L}=\frac{V_z}{R_L}$
From Kirchhoff's current law,
$I=I_z+I_L$
So, Zener current is, $I_z=I-I_L$
Case I : V_{in} increases but $R_L=$constant **:**
If V_{in} increases then I increases, so I_z increases keeping $V_{out}\ (=V_z)$ constant.
Case II : $V_{in}=$constant but R_L increases **:**
If R_L increases then I_L decreases but $I=$constant. Zener current I_z decreases keeeping $V_{in}\,(=V_z)$ constant.

Q.11. The depletion layer in silicon diode is $1\ \mu\mathrm{m}$ wide and the knee potential is $0.6\ \mathrm{V}$, then the electric field in the depletion layer will be

A) Zero

B) 0.6 V m^{-1}

C) $6 \times 10^4 \text{ V m}^{-1}$

D) $6 \times 10^5 \text{ V m}^{-1}$

Answer: $6 \times 10^5 \text{ V m}^{-1}$

Solution: Given, the depletion layer $= 1\ \mu\text{m}$ and knee potential $= 0.6\ \text{volt}$. Depletion region: An insulating region within a conductive, doped semiconductor material where the mobile charge carriers have been diffused away or have been forced away by an electric field. The only elements left in the depletion region are ionised donor or acceptor impurities. This region of uncovered positive and negative ions is called the depletion region due to the depletion of carriers in this region. By using:

$$E = \frac{V}{d} \Rightarrow E = \frac{(0.6)}{(1 \times 10^{-6})} = 6 \times 10^5 \text{ V m}^{-1}.$$

Q.12. How many NAND gates are required to form an AND gate (minimum)?

A) 1

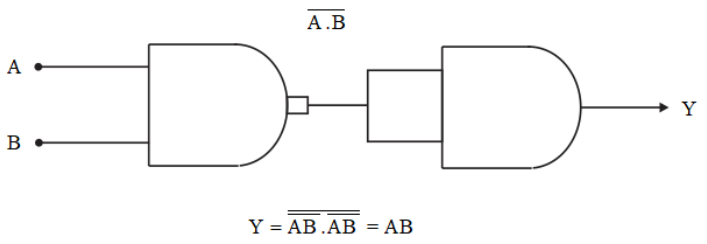
B) 2

C) 3

D) 4

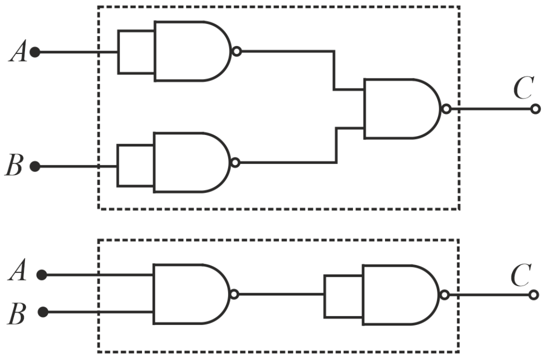
Answer: 2

Solution: Two NAND gates are required to form an AND gate as depicted in the following figure:



So, the number is two.

Q.13. The combinations of NAND gates shown here are equivalent to:



A) OR gate and an AND gate, respectively.

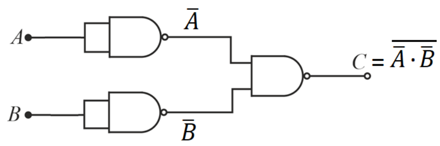
B) AND gate and a NOT gate, respectively.

C) AND gate and an OR gate, respectively.

D) OR gate and a NOT gate, respectively.

Answer: OR gate and an AND gate, respectively.

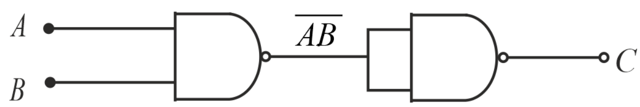
Solution: In the first diagram,



Here, $C = \overline{\overline{A} \cdot \overline{B}} = \overline{\overline{A}} + \overline{\overline{B}} = A + B$ (From De-Morgan's theorem)

Here, output C is equivalent to OR gate.

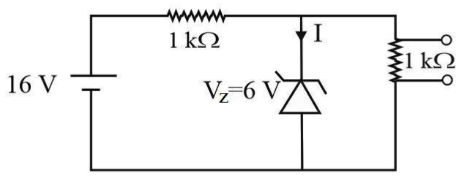
For the lower part,



Here, $C = \overline{\overline{A \cdot B}} = A \cdot B$.

Here, output C is equivalent to AND gate.

Q.14. What is the value of current I in the given circuit?



A) $6 \mathrm{~mA}$

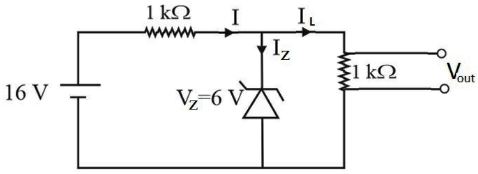
B) $4 \mathrm{~mA}$

C) $10 \mathrm{~mA}$

D) zero

Answer: $4 \mathrm{~mA}$

Solution: We are given a circuit, we need to find the current I



In the given figure, load resistance and Zener diode both are parallel.

So, the current through the load resistance is , $I_L=\frac{V_Z}{R_L}$

$\Rightarrow I_L=\frac{6}{1}=6\ \text{mA}$

The current through the series resistance,
$I=\frac{V_{in}-V_z}{R}$
$\Rightarrow I=\frac{16-6}{1}=10\ \text{mA}$

Current through the Zener diode,
$I_z=I-I_L$
$\Rightarrow I_z=10-6$
$\Rightarrow I_z=4\ \text{mA}$

Q.15. If the input to a full-wave rectifier is $e=50\ \sin(314t)\ \text{volt}$ and its diode and load resistances are $100\ \Omega$ and $1\ \text{k}\Omega$, respectively, then

(I) it's pulse frequency of output voltage is 100,

(II) it's input power is $1136\ \text{mW}$,

(III) it's output power is $838\ \text{mW}$,

(IV) it's efficiency is 81.2%.
Choose the correct option based on the above information.

A) $(\text{I}),\ (\text{III})$

B) $(\text{I}),\ (\text{II})$

C) $(\text{I}),\ (\text{II}),\ (\text{III})$

D) $(\text{I}),\ (\text{II}),\ (\text{III}),\ (\text{IV})$

Answer: $(\text{I}),\ (\text{II}),\ (\text{III})$

Solution: Given,
$e=50\sin(314t)$
$e_0=50\text{ V},\ \omega=314\text{ Hz}.$

(i) In a full wave rectifier, pulse frequency is,
$f_0=2f$
$f_0=2\frac{\omega}{2\pi}=\frac{\omega}{\pi}$
$\Rightarrow f_0=\frac{314}{3.14}$
$\Rightarrow f_0=100\text{ Hz}.$

(ii) Input power,
$P_{\text{i}}=\frac{e_0^2}{2(r_{\text{f}}+R_{\text{L}})}$
$\Rightarrow P_{\text{i}}=\frac{50^2}{2(100+1000)}=1136\text{ mW}.$

(iii) Output power,
$P_o=\left[\frac{2V_o}{\pi(r_{\text{f}}+R_{\text{L}})}\right]^2\times R_{\text{L}}$
$\Rightarrow P_o=\frac{2\times2\times50\times50\times1}{\pi\times\pi\times1.1\times1.1}=838\text{ mW}.$

(iv) Efficiency,
$\eta=\frac{\text{output power}}{\text{input power}}\times100$
$\Rightarrow\eta=\frac{838}{1136}\times100=73.76\%$

Note - Load resistance is $1\text{ k}\Omega$

Q.16. A transistor is used as an amplifier in CB mode with a load resistance of $5\text{ k}\Omega$. If the current gain of the amplifier is 0.98 and the input resistance is $70\ \Omega$, the voltage gain and power gain, respectively, are

A) $70,\ 68.6$

B) $80,\ 75.6$

C) $60,\ 66.6$

D) $90,\ 96.6$

Answer: $70,\ 68.6$

Solution: Given that,
load resistance, $R_L=5\text{ k}\Omega$,
common base current gain, $\alpha=0.98$ and
input resistance, $R_i=70\ \Omega$,
voltage gain is the ratio of change in output voltage to the change in input voltage.
$A_V=\frac{\Delta V_{CE}}{\Delta V_{BE}}$
$=\frac{\Delta i_c\times R_L}{\Delta i_b\times R_i}$
$=\alpha\times\frac{R_L}{R_i}$
$=0.98\times\frac{5\times10^3}{70}$
$\Rightarrow A_V=70$

Power gain,
$A_P=\alpha^2\frac{R_L}{R_i}$
$=0.98^2\times\frac{5\times10^3}{70}$
$\Rightarrow A_P=68.6$

Q.17. In n-p-n transistor, 10^{10} electrons enter the emitter region in 10^{-6} s. If 2% electrons are lost in the base region, then the collector current and the current amplification factor (β), respectively, are

A) $1.57\text{ mA},\ 49$

B) $1.92\ \text{mA},\ 70$

C) $2\ \text{mA},\ 25$

D) $2.25\ \text{mA},\ 100$

Answer: $1.57\ \text{mA},\ 49$

Solution:

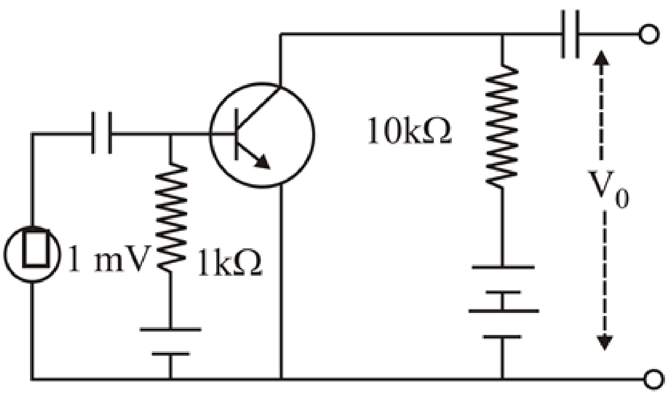
It is given that 10^{10} electrons eneter the emittor region. 2% enter the base region and the balance enter the collector.

Number of electrons reaching the collector,
$n_c = \frac{98}{100} \times 10^{10}$
$\Rightarrow n_c = 0.98 \times 10^{10}$
Number of electrons reaching the base in time t,
$n_B = \frac{2}{100} \times 10^{10} = 2 \times 10^8$
Collector current,
$i_c = \frac{n_e \times e}{t}$

Base current,
$i_B = \frac{n_B \times e}{t}$
Current transfer ratio in CE configuration is,
$\beta = \frac{i_C}{i_B} = \frac{n_C}{n_B}$
$\beta = \frac{0.98 \times 10^{10}}{0.02 \times 10^{10}} = 49$

Emitter current is, $i_E = \frac{10^{10} \times 1.6 \times 10^{-19}}{10^{-6}} = 1.6\ \text{mA}$
Base current is, $i_B = \frac{0.02 \times 10^{10} \times 1.6 \times 10^{-19}}{10^{-6}} = 0.032\ \text{mA}$
Collector curent is,
$i_C = i_E - i_B$
$\Rightarrow i_C = (1.6 - 0.032)\ \text{mA}$
$\Rightarrow i_C = 1.568\ \text{mA} \approx 1.57\ \text{mA}$

Q.18. In the following common emitter configuration, an n-p-n transistor, with current gain $\beta = 100$, is used. The output voltage of the amplifier will be



A) $10\ \text{mV}$

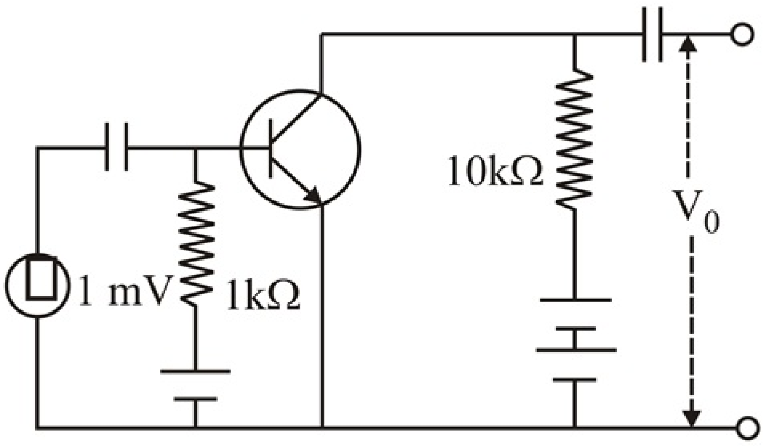
B) $0.1\ \text{V}$

C) $1.0\ \text{V}$

D) $10\ \text{V}$

Answer: 1.0 V

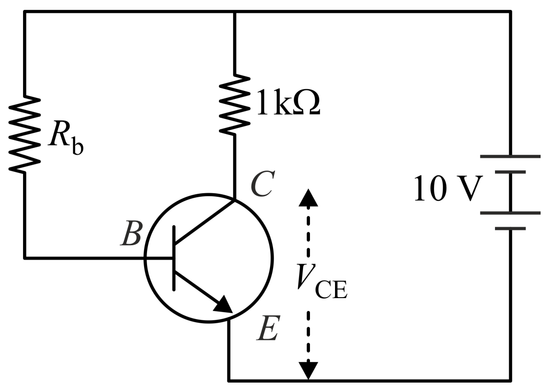
Solution: Given:
$\beta = 100$
$R_i = 1\ \text{k}\Omega$
$R_L = 10\ \text{k}\Omega$
$V_i = \Delta V_{BE} = 1\ \text{mV}$



Voltage gain $(A_V) = \frac{\Delta V_{CE}}{\Delta V_{BE}} = \beta \times \frac{R_L}{R_i}$
$\Rightarrow \Delta V_{CE} = \Delta V_{BE} \times \beta \times \frac{R_L}{R_I}$
$\Rightarrow \Delta V_{CE} = 1 \times 10^{-3} \times 100 \times \frac{10}{1}$

$\Rightarrow \Delta V_{CE} = 1.0\ \text{V}$

Q.19. In the circuit shown, the transistor used has a current gain of $\beta = 100$. What should be the base resistor R_b so that, $V_{CE} = 5\ \text{V},\ V_{BE} = 0$?



A) $1\ \times\ 10^3\ \Omega$

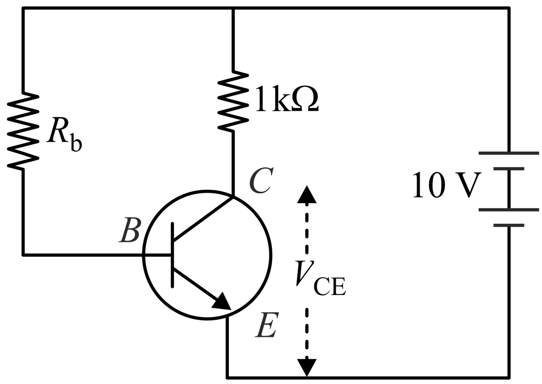
B) $500\ \Omega$

C) $200\ \times\ 10^3\ \Omega$

D) $2\ \times\ 10^3\ \Omega$

Answer: $200\ \times\ 10^3\ \Omega$

Solution: Given:
$\beta = 100$
$V_{CC} = 10 \text{ V}$
$V_{CE} = 5 \text{ V}$
$R_C = 1 \text{ k}\Omega$



$i_C = \frac{V_{CC} - V_{CE}}{R_C} = \frac{10-5}{1000} = 5 \times 10^{-3} \text{ A}$

Also,

$V_{CC} = i_B R_B$

We know that, current amplification factor,
$\beta = \frac{i_C}{i_B} \Rightarrow i_B = \frac{i_C}{\beta}$

Then,
$V_{CC} = \frac{i_C}{\beta} R_B$

$\Rightarrow R_B = \frac{\beta V_{CC}}{i_C}$
$\Rightarrow R_B = \frac{100 \times 10}{5 \times 10^{-3}}$
$= 200 \times 10^3 \ \Omega$

Q.20. The length of a germanium rod is 0.58 cm and its area of cross-section is 1 mm^2. If for germanium $n_i = 2.5 \times 10^{19} \text{ m}^{-3}$, $\mu_h = 0.19 \text{ m}^2 \text{ (V s)}^{-1}$, $\mu_e = 0.39 \text{ m}^2 \text{ (V s)}^{-1}$, then the resistance of the rod will be -

A) $2.5 \text{ K}\Omega$

B) $5.0 \text{ K}\Omega$

C) $7.5 \text{ K}\Omega$

D) $10.0 \text{ K}\Omega$

Answer: $2.5 \text{ K}\Omega$

Solution: Given date, $l=0.58\times10^{-2}\,\text{m},\ A=1\times10^{-6}\,\text{m}^2,\ n_i=2.5\times10^{19}\,\text{m}^{-3},\ \mu_h=0.19\,\text{m}^2\,(\text{V s})^{-1}$ and $\mu_e=0.39\,\text{m}^2\,(\text{V s})^{-1}$,

First recall the relation between mobility and conductivity,

$\sigma=\mu ne=(\mu_h+\mu_e)n_ie$

$\Rightarrow\sigma=(0.19+0.39)\times2.5\times10^{19}\times1.6\times10^{-19}=2.32\ \text{mho m}^{-1}$

We know that conductivity is the reciprocal of resistivity,

$\Rightarrow\rho=\frac{1}{\sigma}=\frac{1}{2.32}\,\Omega\text{ m}.$

Now recall the relation between resistance and resistivity,

$R=\frac{\rho l}{A}=\frac{1\times0.58\times10^{-2}}{2.32\times10^{-6}}=2.5\ \times10^{3}\,\Omega.$

Q.21. If the ratio of the concentration of electrons to that of holes in a semiconductor is $\frac{7}{5}$ and the ratio of currents is $\frac{7}{4}$, then what is the ratio of their drift velocity?

A) $\frac{5}{8}$

B) $\frac{4}{5}$

C) $\frac{5}{4}$

D) $\frac{4}{7}$

Answer: $\frac{5}{4}$

Solution: As we know the current in the terms of drift velocity and cross-sectional area is,

$I=neAv_{\text{d}}.$

Therefore, the ratio of current by electrons and holes, $\frac{I_e}{I_h}=\frac{n_e\times(v_d)_e}{n_h\times(v_d)_h}$.

Here, $\frac{n_e}{n_h}=\frac{7}{5}\ \&\ \frac{I_e}{I_h}=\frac{7}{4}$

So, the ratio becomes

$\Rightarrow\frac{7}{4}=\frac{7}{5}\times\frac{(v_d)_e}{(v_d)_h}$

$\Rightarrow\frac{(v_d)_e}{(v_d)_h}=\frac{5}{7}\times\frac{7}{4}=\frac{5}{4}$

Therefore, ratio of their drift velocity is $5:4$

Q.22. What is the conductivity of a semiconductor if electron density $n_e=5\times10^{12}\ \text{cm}^{-3}$ and hole density $n_h=\ 8\ \times\ 10^{13}\ \text{cm}^{-3}$? $\left(\mu_e\ =\ 2.3\,\text{m}^2\,\text{v}^{-1}\,\text{s}^{-1}\right.$ and $\left.\mu_h\ =\ 0.01\,\text{m}^2\,\text{v}^{-1}\,\text{s}^{-1}\right)$

A) $5.634\,\Omega^{-1}\,\text{m}^{-1}$

B) $1.968\,\Omega^{-1}\,\text{m}^{-1}$

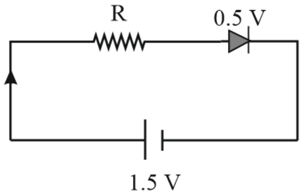
C) $3.421\,\Omega^{-1}\,\text{m}^{-1}$

D) $8.964\,\Omega^{-1}\,\text{m}^{-1}$

Answer: $1.968\,\Omega^{-1}\,\text{m}^{-1}$

Solution: Given electron density $n_e = 5 \times 10^{12}\ \mathrm{cm}^{-3} = 5 \times 10^{18}\ \mathrm{m}^{-3}$
and mobility of electron $\mu_e = 2.3\ \mathrm{m^2 v^{-1} s^{-1}}$ and hole density $n_h = 8 \times 10^{13}\ \mathrm{cm}^{-3} = 8 \times 10^{19}\ \mathrm{m}^{-3}$
$\mu_h = 0.01\ \mathrm{m^2 v^{-1} s^{-1}}$
The conductivity of the semiconductor is
$\sigma = e(\mu_e n_e + \mu_h n_h)$
$= 1.6 \times 10^{-19}(2.3 \times 5 \times 10^{18} + 0.01 \times 8 \times 10^{19})$
$\sigma = 1.968\ \Omega^{-1}\mathrm{m}^{-1}$.

Q.23. The diode used in the circuit shown in the figure, has a constant voltage drop of $0.5\ \mathrm{V}$ at all currents and a maximum power rating of $100\ \mathrm{mW}$. What should be the value of the resistor R, connected in series with the diode, for obtaining maximum current?



A) $1.5\ \Omega$

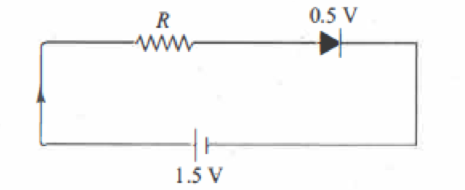
B) $5\ \Omega$

C) $6.67\ \Omega$

D) $200\ \Omega$

Answer: $5\ \Omega$

Solution: The Given circuit,



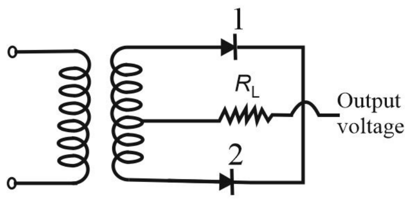
The voltage drop across the diode $(V_D) = 0.5\ \mathrm{V}$
The maximum power rating of the diode,$(P) = 100\ \mathrm{mW} = 100 \times 10^{-3}\ \mathrm{W}$
Source voltage $(V_S) = 1.5\ \mathrm{V}$

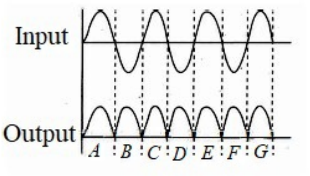
The maximum current possible through diode $(i_D) = \frac{P}{V}$
$\Rightarrow i_D = \frac{0.1}{0.5} = 0.2\ \mathrm{A}$

The current through the diode is the same as the current in the circuit.

Therefore, the value of unknown resistance in the circuit
$\Rightarrow R = \frac{V_S - V_D}{i_D}$
$\Rightarrow R = \frac{1.5 - 0.5}{0.2}$
$\Rightarrow R = \frac{1.0}{0.2} = 5\ \Omega$

Q.24. A full wave rectifier circuit along with the input and output voltage waveforms is as shown in the figure. The output, due to diode (2), is





A) A, C

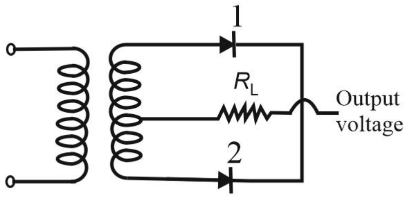
B) B, D

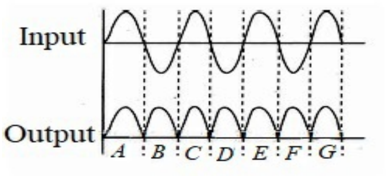
C) E, F

D) D, G

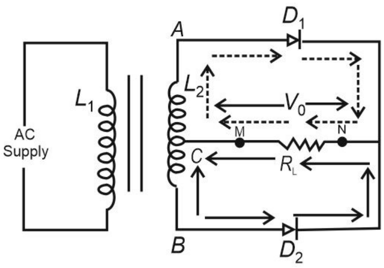
Answer: B, D

Solution: We are given a circuit, we need to find the output voltage due to Diode, D_2



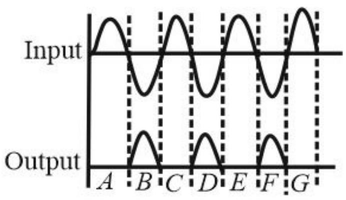


Due to Centre tapped transformer, The positive half signal given at the input(primary coil) is split into two positive half cycles at secondary coil.
During positive half cycle, point A is at higher potential than C, So diode D_1 is in forward bias and Point B is at lower potential than C, so diode D_2 is in reverse bias.



During negative half cycle, point A is at lower potential than C, So diode D_1 is in reverse bias and Point B is at higher potential than C, so diode D_2 is in forward bias.

Thus, the output voltage due to diode, D_2



During negative input half cycles, the diode gives positive half cycles across the load resistor as shown in the figure.

Q.25. A NPN transistor is connected in a common emitter configuration in which the collector supply is 8 volt and the voltage drop across the load resistor of 800 ohm connected to the collector circuit is 0.8 volt. If the current amplification factor α is $\frac{25}{26}$ and the input resistance of the transistor is 200 ohm then the collector-emitter voltage, base current, voltage and power gain are-

A) $3.5\ \text{V},\ 2 \times 10^{-5}$ A and $A_V = 50,\ A_P = 6500$

B) $7.2\ \text{V},\ 4 \times 10^{-5}$ A and $A_V = 100,\ A_P = 2500$

C) $4.5\ \text{V},\ 3 \times 10^{-5}$ A and $A_V = 50,\ A_P = 6500$

D) $5.6\ \text{V},\ 3 \times 10^{-5}$ A and $A_V = 60,\ A_P = 7500$

Answer: $7.2\ \text{V},\ 4 \times 10^{-5}$ A and $A_V = 100,\ A_P = 2500$

Solution: Given,
Collector voltage is, $V_{CC}=8\text{ V}$
Output resistance is, $R_o=800\ \Omega$
Voltage drop across output resistance is, $i_C R_o=0.8\text{ V}$
Current amplification factor is, $\alpha=\frac{25}{26}$
Input resistance, $R_i=200\ \Omega$

(i) From voltage relation at output circuit is, $V_{CE}=V_{CC}-i_C R_o$
$\Rightarrow V_{CE}=8-0.8=7.2\text{ V}$

(ii) From voltage across output resistance is, $i_C R_o=0.8\text{ V}$
$\Rightarrow i_C=\frac{0.8}{R_o}$
$\Rightarrow i_C=\frac{0.8}{800}=1\times10^{-3}\text{ A}$

Now from current gain in terms of current amplification factor is given by, $\beta=\frac{I_C}{I_B}=\frac{\alpha}{1-\alpha}\ldots(1)$
$\Rightarrow \beta=\cdot=\frac{\frac{25}{26}}{1-\frac{25}{26}}=\frac{\frac{25}{26}}{\frac{1}{26}}=25$
Using (1), we have
$\Rightarrow 25=\frac{1\times10^{-3}}{I_B}$
$\Rightarrow I_B=\frac{1\times10^{-3}}{25}=4\times10^{-5}\text{ A}$

(iii) Voltage gain is given by, $A_V=\beta\frac{R_o}{R_i}$
On putting all the corresponding values in above expression, we have
$\Rightarrow A_V=25\times\frac{800}{200}=100$
Power gain is given by, $A_P=\beta\times A_V$
$\Rightarrow A_P=25\times100=2500$

Practice more on Electronic Devices