DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 7

Topic :- SEMICONDUCTOR ELECTRONICS: MATERIALS,DEVIES AND SIMPLE CIRCUITS

1 **(c)**

The resistance of semiconductor decreases with the increase in temperature

2 **(d)**

$$\lambda = \frac{hc}{E} = \frac{6.62 \times 10^{-34} \times 3 \times 10^{8}}{(1.14 \times 1.6 \times 10^{-19})} = 10{,}888\text{Å}$$

3 **(c)**

Voltage gain $= \frac{\text{Output voltage}}{\text{Input voltage}}$

$\Rightarrow V_{out} = V_{in} \times$ Voltage gain

$\Rightarrow V_{out} = V_{in} \times$ Current gain $\times$ Resistance gain

$$= V_{in} \times \beta \times \frac{R_L}{R_{BE}} = 10^{-3} \times 100 \times \frac{10}{1} = 1V$$

4 **(d)**

$$r_p = \frac{\Delta V_p}{\Delta i_p} = \frac{150 - 100}{(12 - 7.5) \times 10^{-3}} = \frac{50}{4.5} \times 10^{3} = 11.1 k\Omega$$

5 **(c)**

$$\alpha = \frac{I_c}{I_e} < 1 \text{ or } I_c < I_e.$$

6 **(b)**

The input of OR gate is $Y = A + B$

7 **(d)**

In a forward biased *p-n* junction, the applied potential is opposite to the junction barrier potential V_B. The consequence of this is the effective barrier potential reduces. Hence, the graph (d) is correctly shown.

8 **(d)**

Number density of atoms in silicon specimen $= 5 \times 10^{28}$ atoms/m$^2 = 5 \times 10^{7}$ silicon atoms, so total number of indium atoms doped per atoms, so total number of indium atoms doped per cm^3 of silicon will be

$n = 5 \times 10^{22} / 5 \times 10^{7} = 10^{15}$ atoms cm^{-3}.

9 **(c)**

For 'NAND' gate (option c), output $=\overline{0.1}=\overline{0}=1$

10 **(c)**

The junction diode I will provide output when forward biased. It will be so during negative half cycle of input AC voltage applied.

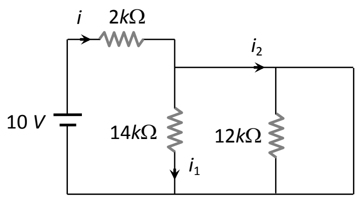
11 **(c)**

If inputs are A and B then output for NAND gate is $Y=\overline{AB}$

$\Rightarrow$ If $A=B=1, Y=\overline{1.1}=\overline{1}=0$

12 **(d)**

Equivalent circuit can be redrawn as follows



$i=\frac{10}{2}=5\ mA=i_2$

$i_1=0$

13 **(c)**

Because As is pentavalent impurity

14 **(c)**

$$V_{dc}=V_{ac}=\frac{2V_0}{\pi}=\frac{2\times 6.28}{3.14}=4V$$

15 **(c)**

$$E_g=h\text{v}=\frac{hc}{\lambda}=\left(\frac{6.63\times 10^{-34}\times 3\times 10^{8}}{2480\times 10^{-9}\times 1.6\times 10^{-19}}\right)=0.5\text{ eV}$$

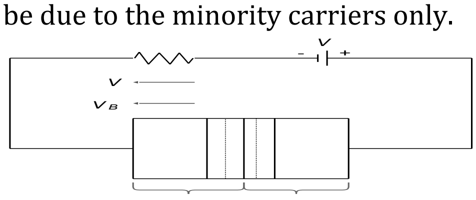
16 **(b)**

$V_k=$ knee voltage $=0.3\ V$

$\therefore$ Resistance $=\frac{\Delta V}{\Delta i}=\frac{(2.3-0.3)}{(10-0)\times 10^{-3}}=200\Omega=0.2k\Omega$

17 **(b)**

In reverse biasing, the applied voltage V on the n-side is positive and is negative on the p-side. The applied bias V and the barrier potential V_B are in the same direction making the effective junction potential $V+V_B$. As a result, the junction width will increase. The higher junction potential would restrict the flow of majority carriers to a much greater extent. However, such a field will favour the flow of minority carriers. So, reverse bias current will be due to the minority carriers only.



18 **(c)**

The current through the battery is

$$I = \frac{10V}{5\Omega + 5\Omega} = \frac{10V}{10\Omega} = 1A$$

20 **(b)**

In common emitter amplifier

Voltage gain = current gain × resistance gain

Or $A_V = \beta \times \frac{R_o}{R_i}$

Or $\frac{V_o}{V_i} = \beta \frac{R_o}{R_i}$

Or $\frac{3}{0.01} = 100 \times \frac{R_o}{1 \times 10^3}$

Or $R_o = \frac{3}{0.01} = 3\ \text{k}\Omega$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	C	D	C	D	C	B	D	D	C	C
Q.	11	12	13	14	15	16	17	18	19	20
A.	C	D	C	C	C	B	B	C	C	B