DPP

DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 1

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

2 **(a)**

We know that

$\beta = \frac{\Delta I_c}{\Delta I_b}$ or $\Delta I_c \Delta\beta\Delta I_b = 40 \times 100\mu A$

3 **(a)**

Number of atoms per unit cells is given by

$N = N_b + \frac{N_f}{2} + \frac{N_C}{8}$

where, N_b is the number of atoms centered in the body of the cell, N_f is the number of atoms centered in the face of the unit cell and N_C is the number of atoms centered at the corner.

For fcc lattice $N_b = 0$, $N_f = 6$ and $N_C = 8$

$\therefore = 0 + \frac{6}{2} + \frac{8}{8} = 3 + 1 = 4$

5 **(a)**

First diode is in reverse biasing it acts as open circuit, hence no current flows

6 **(b)**

Here $p - n$ junction as forward biased with voltage

$= 5 - 3 = 2$ V.

$\therefore$ Current $I = \frac{2}{200} = \frac{1}{100} = 10^{-2}$A

7 **(d)**

Radiowaves of constant amplitude can be produced by using oscillator with proper feedback.

8 **(a)**

$I_p = 0.004\ (V_p + 10V_g)^{3/2} mA$

$\Rightarrow \frac{\Delta I_p}{\Delta V_g} = 0.004\left[\frac{3}{2}(V_p + 10V_g)^{1/2} \times 10\right] \times 10^{-3}$

$\Rightarrow g_m = 0.004 \times \frac{3}{2}(120 + 10 \times -2)^{1/2} \times 10 \times 10^{-3}$

$\Rightarrow g_m = 6 \times 10^{-4} mho = 0.6\ m\ mho$

Comparing the given equation of I_p with standard equation $I_p = K(V_p + \mu V_g)^{3/2}$ we get

$$\mu = 10$$

Also from $\mu = r_p \times g_m \Rightarrow r_p = \frac{\mu}{g_m} = \frac{10}{0.6 \times 10^{-3}}$

$\Rightarrow r_p = 16.67 \times 10^3 \Omega = 16.67 k\Omega$

9 **(a)**

In $p - n$ junction, the barrier potential offers resistance to free electrons in n-region and holes in p-region.

10 **(d)**

$V_{g_2} = V_{g_1}\left(\frac{V_{p_2}}{V_{p_1}}\right) = -5\left(\frac{200}{150}\right) = -6.66\ \text{V}$

11 **(b)**

Resistivity is the intrinsic property, it doesn't depend upon length and shape of the semiconductors

13 **(b)**

$n_i^2 = n_e n_h$

$(1.5 \times 10^{16})^2 = n_e(4.5 \times 10^{22})$

$n_e = 0.5 \times 10^{10} = 5 \times 10^9$

$n_h = 4.5 \times 10^{22}$

$n_h \gg n_e$

Semiconductor is p-type and $n_e = 5 \times 10^9 m^{-3}$

14 **(b)**

The output of the circuit is,

$Y = \overline{\overline{A} + \overline{B}}$

$= \overline{\overline{A}} \cdot \overline{\overline{B}}$

$= A \cdot B \quad (\because \overline{\overline{A}} = A$ and $\overline{\overline{B}} = B)$

Which is the output of an AND gate.

15 **(a)**

For Ge, $E_g = 0.7\ eV = 0.7 \times 1.6 \times 10^{-19} J = 1.12 \times 10^{-19} J$

18 **(d)**

Boron is a trivalent impurity having three valence electrons. When it is introduced to pure silicon, then such type of semiconductors are called p-type or acceptor type semiconductors.

19 **(c)**

In reverse bias applied to a p-n junction diode raises the potential barrier because p-type material connected to the negative terminal and pulled the holes away from the junction similarly n-type material connected to positive terminal and pulled the electrons. Therefore the depletion region wider.

20 **(b)**

In half wave rectifier $V_{dc} = \frac{V_0}{\pi} = \frac{10}{\pi}$

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