DPP

DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 5

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

1 **(a)**

$n_i^2 = n_h n_e \Rightarrow (10^{19})^2 = 10^{21} \times n_e \Rightarrow n_e = 10^{17}/m^3$

2 **(d)**

Atomic packing factor $= \frac{\text{volume occupied by the atoms in a unit cell}}{\text{volume of the unit cell}}$

3 **(a)**

Number of lattice points in a crystal structure will be

$$n = \frac{N_C}{8} + \frac{N_F}{2} + \frac{N_i}{1}$$

In bcc crystal, $N_C = 8$, $N_F = 0$ and $N_i = 1$

$$n = \frac{8}{8} + \frac{0}{1} + \frac{1}{1} = 2$$

4 **(a)**

Output signal voltage has phase difference of 180° with respect to input

5 **(d)**

GaAs ($Eg = 1.5\ eV$) is used for making infrared LED

6 **(c)**

In simple cubic lattice, volume, $V = a^3$

density $= \frac{\text{mass of unit cell}}{\text{volume of unit cell}} = \frac{A/N}{V} = \frac{A}{Na^3}$

7 **(c)**

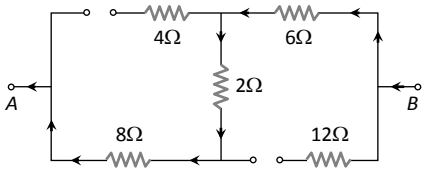
Phosphorus is pentavalent impurity

8 **(c)**

According to the given figure A is at lower potential $w.r.t.\ B$. hence both diodes are in reverse biasing, so equivalent circuit can be redrawn as follows

$\Rightarrow$ Equivalent resistance between A and B

$R = 8 + 2 + 6 = 16\ \Omega$



10 **(d)**

When reverse bias is increased the electron field across the junction also increases. At some stage the electric field becomes so high that it breaks the covalent bonds creating electron-hole pairs. This mechanism is known as zener breakdown. In breakdown region for a long range of load (R_L) the voltage remains the same though the current may be large.

11 **(c)**

Potential barrier energy (E_b) = work function (W_0) + fermi energy (E_f).

12 **(c)**

In P-type semiconductors, holes are the majority charge carriers

13 **(d)**

In positive half cycle one diode is in forward biasing and other is in reverse biasing while in negative half cycle their polarity reverses, and direction of current is opposite through R for positive and negative half cycles so out put is not rectified.

Since R_1 and R_2 are different hence the peaks during positive half and negative half of the input signal will be different

14 **(b)**

FET is unipolar

15 **(c)**

Electric conduction in semi-conductor takes place due to both electrons and holes.

16 **(b)**

For forward bias, $I = \frac{V}{R} = \frac{5}{25+10} = \frac{5}{35} = \frac{1}{7}A$

17 **(c)**

The output $F = (W + X)\,(W + Y) = W + (X \cdot Y)$

18 **(c)**

$$\beta = \frac{\alpha}{1-\alpha} = \frac{0.95}{1-0.95} = \frac{0.95}{0.05} = 19$$

19 **(a)**

In the given condition diode is in reverse biasing so it acts as open circuit. Hence potential difference between A and B is $6V$

20 **(a)**

If $A = 1$, $B = 1$ and $Y = 0$, the gate can be NOR gate, NAND gate or exclusive NOR gate (ie, XOR gate).

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