

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

2 (b)

$$\text{Voltage gain } A_v = \frac{\mu}{1 + \frac{r_p}{R_L}}$$

$$\therefore R_L = 1.5r_p \Rightarrow A_v = \frac{\mu}{1 + \frac{r_p}{1.5r_p}} = \frac{3}{5}\mu = \frac{3}{5} \times 20 = 12$$

4 (d)

$$\beta = \frac{\Delta i_c}{\Delta i_b} = \frac{(10 - 5) \times 10^{-3}}{(200 - 100) \times 10^{-6}} = 50$$

5 (a)

For forward biasing of $p - n$ junction, the positive terminal of external battery is to be connected to p -semiconductor and negative terminal of battery to the n -semiconductor.

6 (c)

A p -type material is electrically neutral.

7 (b)

$$\text{Plate resistance} = \frac{1}{\text{slope}} = \frac{1}{10^{-3} \times 10^{-3}} = 10^6 \Omega$$

= 1000 $k\Omega$ (static)

8 (d)

Covalent bonding exists in semi-conductor

9 (a)

Because electrons need less energy to move

10 (c)

$$A_v = -\frac{V_o}{V_i}$$

$$\text{or } V_o = -A_v \times V_i = -30 \sin 100\pi t.$$

11 (a)

$$\beta = \frac{I_C}{I_B} \text{ and } I_E = I_C + I_B$$

$$\therefore \frac{I_C}{I_E - I_C} = \frac{5.488}{5.60 - 5.488} = 49$$

12 **(b)**
The upper junction diode is forward biased and middle junction diode is reverse biased.
So, effective resistance of circuit = $10 + 10 = 20 \Omega$.

$$I = \frac{3}{20} = 0.15 \text{ A}$$

13 **(c)**
Here,
Collector current, $I_C = 25 \text{ mA}$
Base current, $I_B = 1 \text{ mA}$
As $I_E = I_B + I_C = (1 + 25) \text{ mA} = 26 \text{ mA}$
As $\alpha = \frac{I_C}{I_E} = \frac{25 \text{ mA}}{26 \text{ mA}} = \frac{25}{26}$

14 **(b)**
The maximum voltage gain $(A_v)_{max} = \mu$
(Which is obtained when $R_L = \infty$)

15 **(c)**
Vander Waal's force is weak dipole-dipole interaction

16 **(a)**
The Boolean expression for 'NOR' gate is $Y = \overline{A + B}$
i.e., if $A = B = 0$ (Low), $Y = \overline{0 + 0} = \overline{0} = 1$ (High)

17 **(d)**
Grid is maintained between 0 volt to certain negative voltage

18 **(a)**
The highest energy level which an electron can occupy in the valence band at 0 K, is called Fermi energy level

19 **(b)**
In a transistor the base is a conductor of low resistance.

20 **(c)**
For any fixed value of the grid bias, the plate current increases as the plate voltage is increased, because more of electrons are drawn towards the anode. Also, for any fixed value of the plate voltage, more plate current flows when the grid is positive. As grid is made more and more negative, electrons are repelled back and very few reach the anode, when the grid becomes highly negative no electrons reach the plate. Thus, for a fixed plate voltage, it is possible to cut out anode current completely by making the grid suitably negative. This is called the cut-off voltage, hence, plate current is reduced.

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

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