DPP

DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 4

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

1 **(c)**

$$\alpha = 0.8 \Rightarrow \beta = \frac{0.8}{(1-0.8)} = 4$$

Also $\beta = \frac{\Delta i_c}{\Delta i_b} \Rightarrow \Delta i_c = \beta \times \Delta i_b = 4 \times 6 = 24 mA$

2 **(c)**

When p-end of p-n junction is connected to positive terminal of battery and n-end to negative terminal of battery, then p-n junction is said to be in forward bias. In forward bias, the more numbers of electrons go from n-region to p-region and more number of holes go from p-region to n-region. Therefore, major current due to both types of carriers takes place through the junction causing, more recombination of electron hole pairs thus causing reduction in height of depletion region and barrier potential.

3 **(b)**

In materials like gallium arsenide the number of photons of light energy is sufficient to produce quite intense visible light.

5 **(a)**

The first data gives value of plate resistance

$$r_p = \frac{\Delta V_p}{\Delta i_p} = \frac{10}{0.8 \times 10^{-3}} = \frac{10^5}{8}\,\Omega$$

Also $g_m = \frac{\Delta i_p}{\Delta V_g}$ and $g_m = \frac{\mu}{r_p}$

$$\Rightarrow \Delta V_g = \frac{\Delta i_p \times r_p}{\mu} = \frac{4 \times 10^{-3} \times 10^5/8}{8} = 6.25\,V$$

6 **(c)**

For the given combination

$Y = (A + B) \cdot C$

$Y = 1$

If $A = 1$

$B = 0$

$C = 1$

7 **(c)**

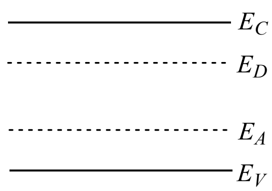
To convert decimal to binary we divide progressively the decimal number by 2 and write 5down remainder after each division. The remainder taken in reverse order, form the binary number.

2	429-1
2	241-0
2	107-1
2	53-1
2	26-0
2	13-1
2	6-0
2	3-1
	1-0

Hence, BCD equivalent of 429 is 110101101.

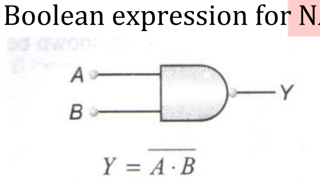
8 **(d)**

The energy emitted by LED is equal to or less than the band gap, because one has also two other energy bands due to the acceptor and donor levels just above E_V and just below E_C



9 **(a)**

NAND gate is obtained when the output of AND gate is made as the input of NOT gate Boolean expression for NAND gate is



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

A	B	Y
0	0	1
1	0	1
0	1	1
1	1	0

10 **(c)**

Forward biased resistance $= \frac{\Delta V}{\Delta I} = \frac{0.7 - 0.6}{(15-5) \times 10^{-3}}$

$= \frac{0.1}{10 \times 10^{-3}} = 10\ \Omega$

11 **(c)**

If trivalent impurity is mixed with pure germanium crystal, the crystal so obtained is called p-type semiconductor. Here, aluminium and indium atoms are trivalent impurity atoms.

12 **(d)**

Current in the circuit = 10 mA = 10×10^{-3} A

and voltage in the circuit = 6 −2 = 4 V

from Ohm's law,

$V = IR$

$$\therefore = \frac{V}{I} = \frac{4}{10 \times 10^{-3}} = 400\ \Omega$$

13 **(d)**

Boolean expression of the given circuit is $Y = \overline{\overline{A+B} + \overline{A+B}} = A + B$

14 **(b)**

Here emitter is forward biased and is common between input and output circuit. Thus the circuit is of $n-p-n$ transistor with a common emitter amplifier mode.

15 **(c)**

$(11010.101) = 1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 +$
$1 \times 2^1 + 0 \times 2^0 + 1 \times 2^{-1} +$
$0 \times 2^{-2} + 1 \times 2^{-3}$

$$= 16 + 8 + 0 + 2 + 0 + \frac{1}{2} + 0 + \frac{1}{8} = 26 + \frac{1}{2} + \frac{1}{8}$$

$$= 26\frac{5}{8} = 26.625$$

16 **(c)**

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

$\left.\begin{array}{l} A = 0\ B = 0 \\ \overline{A} = 1\ \overline{B} = 1 \end{array}\right] Y = 0$

$\left.\begin{array}{l} A = 0\ B = 1 \\ \overline{A} = 1\ \overline{B} = 0 \end{array}\right] Y = 1$

$\left.\begin{array}{l} A = 1\ B = 0 \\ \overline{A} = 0\ \overline{B} = 1 \end{array}\right] Y = 1$

$\left.\begin{array}{l} A = 1\ B = 1 \\ \overline{A} = 0\ \overline{B} = 0 \end{array}\right] Y = 0$

17 **(c)**

$I = n_e A v_d$

$$\frac{I_e}{I_h} = \frac{n_e \times (v_d)_e}{n_h \times (v_d)_h}$$

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

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

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

18 **(c)**

$$I_2 = I_1 \left(\frac{V_2}{V_1}\right)^{3/2} = 10 \left(\frac{200}{50}\right)^{3/2} = 80 \text{ mA}$$

19 **(d)**

$(11001.001)_2 = 1 \times 2^0 + 0 \times 2^1 + 0 \times 2^2 + 1 \times 2^3 + 1 \times 2^4 + 0 \times 2^{-1} + 0 \times 2^{-2} + 1 \times 2^{-3} = 25.125$

20 **(d)**

In an intrinsic semiconductor, $n_e = n_h$

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