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# TEC-101

**B. TECH. (FIRST SEMESTER)**

**MID SEMESTER**

**EXAMINATION, Oct., 2023**

**BASIC ELECTRONICS ENGINEERING**

**Time : 1½ Hours**

**Maximum Marks : 50**

**Note :** (i) Answer all the questions by choosing any *one* of the sub-questions.

(ii) Each sub-question carries 10 marks.

1. (a) (i)  $(463.71)_8 = (?)_2 = (?)_{16} = (?)_{10}$

(ii) If  $(45)_x = (41)_y$  and  $(42)_x = (35)_y$  find the values of  $x$  and  $y$ . (CO1)

OR

(b) (i) Subtract  $(745)_8 - (5A)_{16}$  by 1's complement method.

(ii)  $(110110)_2 + (3B)_{16} - (76)_8 = (?)_2 = (?)_8 = (?)_{16}$ . (CO1)

**P. T. O.**

2. (a) (i) If  $AB' + A'B = C$ , then prove that :

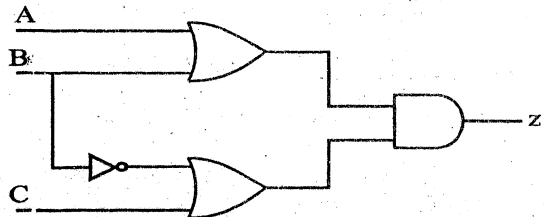
$$AC' + A'C = B.$$

- (ii) Simplify the given Boolean function :

$$X \oplus Y \oplus XY. \quad (\text{CO1})$$

OR

- (b) (i) Express the output Z of given circuit in canonical POS form :



- (ii) Name the logic gate for the given truth table and realize it using NAND gates only : (CO1)

Inputs		Output
A	B	X
0	0	0
0	1	1
1	0	1
1	1	0

3. (a) Minimize the given function by K map and realize the minimized function by  
 (i) basic gates (ii) NAND gates only :

(CO1)

$$F(A, B, C, D) = \sum m(0, 2, 4, 7, 8, 10, 12, 15)$$

OR

- (b) For the given truth table, express output F in minimized SOP and minimized POS form :

(CO1)

X	Y	Z	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

4. (a) What is the significance of doping in semiconductors ? Explain the formation of *n* type semiconductor by doping. (CO2)

P. T. O.

OR

- (b) Calculate the drift current produced in a Ge semiconductor having area of cross section  $2 \text{ cm}^2$  and length  $0.4 \text{ mm}$ . If concentration of free electron is  $2 \times 10^{19} / \text{m}^3$  and a battery of 2 volts is applied across its length. Given that mobility of free electrons and holes is  $0.36 \text{ m}^2/\text{V-sec}$  and  $0.17 \text{ m}^2/\text{V-sec}$  respectively. (CO2)
5. (a) Explain drift current and diffusion current in brief. Find the resistivity of intrinsic Si if intrinsic concentration is  $2.5 \times 10^{10} / \text{cm}^3$ . Mobility of electrons and holes in Si are  $1300 \text{ cm}^2/\text{V-sec}$  and  $500 \text{ cm}^2/\text{V-sec}$  respectively. (CO2)

OR

- (b) Explain the formation of built in (or barrier) potential in an unbiased pn junction diode. What is the effect of biasing on width of depletion layer?

(CO2)