TEC–101

B. TECH. (FIRST SEMESTER)
MID SEMESTER EXAMINATION, Nov., 2022
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) Convert the number : (CO1)

    (i) $\sqrt{(41)_x} = (5)_x$, find the base "*x*".

    (ii) $(3213)_4 = (?)_{10}$

    (iii) $(613263)_8 = (?)_{16}$

    Simplify the following expressions with the help of Boolean algebra :

    (iv) $F = A [B + C (AB + AC)]$

    (v) $F = A + AB + AB'C$

    OR

(b) Simplify following expression with the help of Boolean algebra : (CO1)

    (i) $F = A'BC + AB'C' + A'B'C' + AB'C + ABC$

    (ii) $F = AB + (AC)' + AB'C (AB + C)$

    (iii) $F = A'B'C + (A + B + C)' + A'B'C'D$

Convert the following numbers :

(iv) $(823.45)_{10} = (?)_7$

(v) $(A8C2.0A)_{16} = (?)_{10}$

2. (a) Simplify the following function with the help of K Map :   (CO1)

$$F(A, B, C, D) = A + BC' + ABD' + ABCD$$

OR

(b) Minimize the following by K map and realize the minimized function by :   (CO1)

(i) NAND gate only

(ii) NOR gate only

$$F(A, B, C, D) = \pi M (0, 1, 3, 5, 7, 8, 9, 11, 13, 14, 15)$$

3. (a) If N_D and N_A are donor and acceptor impurities and n_i is the intrinsic concentration, establish the relation for minority and majority charge densities in extrinsic semiconductors.   (CO2)

OR

(b) Define mobility and drift velocity. Prove that conductivity of a conductor is given $o' = \mu ne$. What would be the conductivity of intrinsic and extrinsic (p-type and n-type) semiconductor ?   (CO2)

4. (a) A bar of pure silicon has cross sectional area of $2\,mm^2$ and intrinsic concentration of silicon is $2.5 \times 10^{16}\,m^{-3}$. The free electron and hole motilities are $0.13\ m^2/V\text{-sec}$ and $0.05\,m^2/V\text{-sec}$ respectively. Find the conductivity and length of bar whose resistance is $50\,k\Omega$.   (CO2)

P.T.O.

OR

(b) In a doped semiconductor, there are 4.52×10^{24} holes/m^3 and 1.25×10^{14} electrons/m^3. What will be the carrier density of undoped specimen ?

If electron and hole motilities are $0.38\,m^2V$/-sec and $0.18\,m^2$/V-sec respectively, determine conductivity of intrinsic and doped semiconductor.

(CO2)

5. (a) A small concentration of minority carries is injected into a homogeneous semiconductor crystal at one point. An electric field of 10 V/cm is applied across the crystal and this moves the minority carries a distance of 1 cm in 20 μ sec. Determine mobility (in cm^2/v-sec).

(CO1/CO2)

OR

(b) Simplify the following expression and realize the minimized function by NOR gate only :

(CO1/CO2)

$$F(A, B, C) = A'B'C + A'BC' + A'B + B'C'$$