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# TEC–201

## B. TECH. (SECOND SEMESTER)
## MID SEMESTER
## EXAMINATION, March, 2024
## 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) Realize NOT, AND, OR, XOR, XNOR gates using only : (CO1)

(i) NAND gates

(ii) NOR gates

OR

(b) (i) Convert :

$(A2C.8)_{16} = (?)_2 = (?)_8 = (?)_{10}$

(ii) Perform $(265)_8 + (734)_8$.

(iii) Perform $(9C)_{16} - (E8)_{16}$ using 2's complement.

(CO1)

*P. T. O.*

2. (a) Determine both the Minterms and Maxterms of the following functions : (CO1)

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

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

OR

(b) Realize the following functions as directed : (CO1)

(i) $F(A, B, C, D) = A'B'C' + ABD'$ (using Basic gates)

(ii) $F(A, B, C) = A'B' + AB + AC'$ (using NAND gates)

(iii) $F(A, B, C, D) = (A + C)(B + D)$ (using NAND gates)

(iv) $F(A, B, C, D) = (A' + D')(B + C)$ (using NOR gates)

(CO1)

3. (a) Simplify the following functions using K-map : (CO2)

(i) $F(A, B, C, D) = \Pi M(0, 1, 2, 4, 6, 10, 14)$

(ii) $F(A, B, C, D) = \Sigma_m(1, 5, 10, 11) + d(7, 8, 13, 15)$

OR

(b) Simplify the following functions using laws of Boolean Algebra : (CO2)

(i) $AB + AB'C + A'BC$

(ii) $(AB + A'B')'$

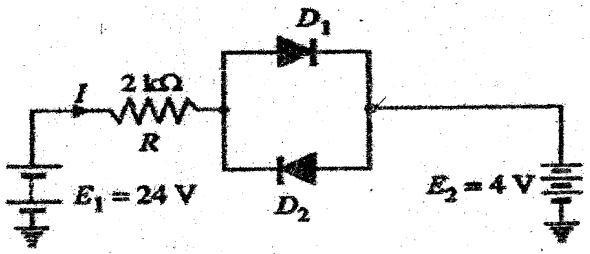
(iii) $(A + B)(A + C) + AB$

4. (a) Draw and explain the energy band diagram of semiconductors. Discuss the formation of P-type and N-type semiconductors. (CO2)

OR

(b) (i) Consider a P-N junction diode operating at room temperature with Forward bias voltage = 0.7 V, Reverse saturation current = $10^{-12}$ A, and Ideality factor = 1. Determine the value of diode current.

(ii) Determine the current I in the following circuit : (CO2)



5. (a) Draw the V-I characteristics of a P-N junction diode. Discuss the breakdown mechanism in detail. (CO2)

OR

(b) Consider a silicon semiconductor with an intrinsic carrier concentration ($n_i$) of $1.5 \times 10^{10}/cm^3$ at room temperature. Find its conductivity. Now if it is doped with phosphorus atoms at a concentration of $1 \times 10^{15}$ $/cm^3$, calculate the majority and minority carrier concentrations. Also find its conductivity after doping considering only majority carrier concentration. (Given : Electron mobility = 1500 $cm^2/V\text{-}s$ and Hole mobility = 500 $cm^2/V\text{-}s$). (CO2)