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TEC–201

B. TECH. (SECOND SEMESTER)

MID SEMESTER

EXAMINATION, April, 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) What are universal logic gates ? Why are they called universal ? Realize the following functions using NAND gates only : (CO1)

(i) AC + A'B'C' + CD'

(ii) (A'+ C').(B + D')

P. T. O.

OR

(b) Perform the following number system conversions : (CO1)

(i) $(58.45)_{10} = (?)_2$

(ii) $(AC.9)_{16} = (?)_2$

(iii) $(1010.101)_2 = (?)_{10}$

(iv) $(634)_{10} = (?)_8$

(v) $(1101.1)_2 = (?)_8$

2. (a) (i) Discuss the duality principle of Boolean algebra with examples.

(ii) State De Morgan's theorem. Verify it using truth table. (CO1)

OR

(b) Simplify the following functions using K-map : (CO1)

(i) $f(A, B, C) = \Sigma m (0, 1, 5, 6, 7)$

(ii) $f(A, B, C, D) = \Sigma m (0, 2, 5, 7) + d(8, 10, 13, 15)$

3. (a) (i) Express $f(A, B, C) = A'B' + BC + AC'$ in canonical SOP form.

(ii) Express $f(A, B, C) = A'(B' + C)$ in canonical POS form.

(iii) Express $f(A, B, C) = A'B'C' + A'B'C + A'BC'$ in simplified form. (CO1)

OR

(b) Perform the following in binary : (CO1)

(i) $(39)_{10} - (19)_{10}$ using 1's complement

(ii) $(52)_{10} - (27)_{10}$ using 2's complement

4. (a) Distinguish between the following : (CO2)

(i) Conductors and Semiconductors

(ii) N type and P type semiconductors

(iii) Drift current and Diffusion current

OR

(b) (i) A silicon diode has a reverse saturation current of 2.5 μA at room temperature. Calculate the value of forward current when a forward bias of 2 V is applied across it.

(ii) If the drift velocity of holes is 100 m/s when an electric field of 200 V/m is applied, calculate the mobility of holes. (CO2)

5. (a) What do you mean by the depletion layer of a P-N junction diode ? Explain the V-I characteristics of a P-N junction diode.

(CO2)

OR

(b) A semiconductor is doped with aluminium atom concentration of $10^{14}/cm^3$. If mobility of electron is 800 $cm^2/V\text{-}s$ and that of hole is 200 $cm^2/V\text{-}s$, calculate the majority and minority carrier concentrations, and the final conductivity. (Given : intrinsic carrier concentration = $1.5 \times 10^{10}/cm^3$).

(CO2)