H Roll No. .....

TEC–101

B. TECH. (FIRST SEMESTER)
MID SEMESTER EXAMINATION, 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) Explain formation of energy bands in a solid crystal. Differentiate conductor, semiconductor and insulator based on energy band diagram.

Calculate the drift current produced in anintrinsic Ge semiconductor having area of cross section 2 cm^2 and length 0.4 mm, if concentration of free electron is $2 \times 10^{19}/m^3$ and a battery of 2 volts is

applied across its length. Given that mobility of free electrons and holes are 0.36 m^2/V-sec and 0.17 m^2/V-sec respectively. (CO2)

OR

(b) Briefly explain drift current and diffusion current in semiconductors. An intrinsic semiconductor (Si) is doped with a donor type impurity such that there is one impurity atom on 10^6 atoms of semiconductor. The total concentration of semiconductor is $5 \times 10^{22}/m^3$ and intrinsic concentration in $2.5 \times 10^{12}/m^3$.

Calculate : (CO2)

(i) Resulting donor atom concentration

(ii) Resulting electron concentration

(iii) Resulting hole concentration

2. (a) Define mobility and drift velocity. Prove that conductivity of a conductor is given by o' = μne. 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). (CO2)

OR

(b) With the help of circuit diagram and suitable graph, explain the working of pn-junction diode in reverse bias mode.

A Si diode has reverse saturation current of 2.5 μA at room temperature. Determine forward voltage to obtain a forward current of 10 mA. (CO2)

3. (a) Perform the following : (CO1)

(i) $(7653.21)_8 = (?)_2 = (?)_{16} = (?)_{10}$

(ii) $(56543)_7 + (53214)_7 - (3264)_8 = (?)_7$

(iii) If $(211)_x = (152)_8$, find the value of base x.

OR

(b) (i) Express F (A, B, C) = (A'C) + (ABC') + (A'B') in canonical SOP form. (CO1)

(ii) Simplify the following functions using Boolean rules :

$$\overline{A + \bar{A}B + \bar{A}\bar{B}} + \overline{A + \bar{B}}$$

$$F = (A + C)(AD + AD) + AC + C$$

$$A + AB + AB'C$$

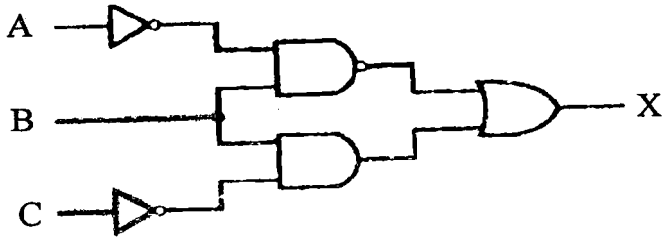
4. (a) (i) Subtract $(FBD9.E3)_{16} - (A2C.A)_{16}$ by 1's and 2's complement method. (CO1)

(ii) $(111.101)_2 \times (111)_2 = (?)_2$

OR

(b) (i) Realize EX-NOR gate by NAND gate only.

(ii) Derive the minimized Boolean expression for output X for given digital circuit. (CO1)



5. (a) Minimize the following by K map and realize the minimized function by (i) Basic gates (ii) NAND gate only (iii) NOR gate only.

F (A, B, C, D) = π(0, 1, 3, 5, 7, 8, 9, 11, 13, 14, 15) (CO1)

OR

(b) For the given truth table, express output Y in minimized SOP and minimized POS form : (CO1)

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