CBCS SCHEME

USN | | | | | | | | | | |

18EC33

Third Semester B.E. Degree Examination, June/July 2023
Electronic Devices

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Explain direct and indirect semiconductors with neat sketches and giving examples. **(06 Marks)**

b. Define:
i) Intrinsic semiconductor
ii) Amphoteric Impurity
iii) Electron mobility
iv) Hall Effect. **(08 Marks)**

c. A silicon is doped with 10^{17} Arsenic atoms/cm^3. What is the equilibrium hole concentration p_o at 300°K? Sketch the resulting band diagram showing where is E_F relative to Ei. Assume $ni^2 = 2.25 \times 10^{20}$. **(06 Marks)**

OR

2 a. Explain effects of temperature and doping on mobility. **(08 Marks)**

b. Explain the formation of extrinsic semi conductor with covalent bonding model diagram. **(06 Marks)**

c. Consider a semiconductor bar with W = 0.1mm, t = 10mm and L = 5mm. For B_2 = 10kG in the direction shown in Fig.Q.2(c) and a current of 1mA, V_{AB} = -2mV, and V_{CD} = 100mV. Find the type of semiconductor carriers and mobility of the majority carrier. Given 1KG = 10^{-5}wb/cm^2. **(06 Marks)**

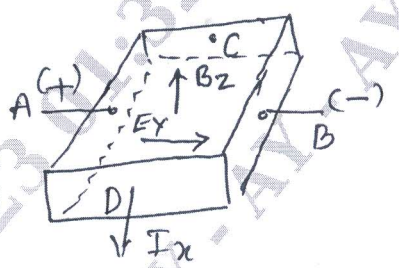

Fig.Q.2(c)

Module-2

3 a. Differentiate Zener and Avalanche breakdown. **(06 Marks)**

b. Explain the requirement for the design of rectifier diode. **(06 Marks)**

c. Explain the working of solar cell and mention the applications of LED. **(08 Marks)**

OR

4 a. Mention the applications of photo diode. **(06 Marks)**

b. Explain the current and voltage in an illuminated junction by deriving the expression for V_{OC}. **(08 Marks)**

c. A solar cell has a short circuit current of 100mA, and an open circuited voltage of 0.8V under full solar illumination. What is the power delivered by the cell which is having a fill factor of 0.7? **(06 Marks)**

Module-3

5 a. Derive the relationship between α and β of a transistor. (06 Marks)
b. Explain switching action of transistor. (08 Marks)
c. A symmetrical p^+np^- bipolar transistor has the following properties:

	Emitter	Base
$A = 10^{-4}$ cm^2	$N_a = 10^{17}$	$N_d = 10^{15}$ cm^{-3}
$W_b = 1\mu m$	$t_n = 0.1\mu s$	$t_p = 10\mu s$
	$\mu_p = 200$	$\mu_n = 1300 cm^2$ v.s
	$\mu_n = 700$	$\mu_p = 450 cm^2$ v.s

Assume $ni = 1.5 \times 10^{10}/cm^3$. Find base current. (06 Marks)

OR

6 a. Explain the working of pnp transistor with necessary figures. (08 Marks)
b. Explain BJT fabrication process. (06 Marks)
c. Explain drift in the base region. (06 Marks)

Module-4

7 a. Explain n-channel PNJFET operation with its characteristics. (10 Marks)
b. Mention the difference between JFET and MOSFET. (04 Marks)
c. Explain the MOS structure with aid of parallel plate capacitor. (06 Marks)

OR

8 a. Explain the operation of p-channel depletion and enhancement type MOSFET with neat sketches. (10 Marks)
b. Mention the applications of MOSFET. (04 Marks)
c. Draw and explain small signal equivalent circuit of a n-channel PNJFET. (06 Marks)

Module-5

9 a. Mention the advantages of IC's over discrete components. (06 Marks)
b. Explain photolithography process. (06 Marks)
c. Explain the working of CMOS inverter with neat diagram. (08 Marks)

OR

10 a. Explain thermal oxidation and diffusion process of the semiconductor fabrication. (08 Marks)
b. Explain integration of other circuit elements. (08 Marks)
c. Define: i) Etching ii) Metallization. (04 Marks)

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