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015303

January 2023

B.Tech. (ENC/EEIOT) III SEMESTER

Semiconductor Devices (ECP-302)

Time : 3 Hours] [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) Differential between direct and indirect semiconductor. (1.5)

(b) What is diffusion in semiconductor? (1.5)

(c) What is photodiode? (1.5)

(d) What do you understand by generation and recombination of carriers? (1.5)

(e) What is solar cell? (1.5)

(f) Why the doping of base region is kept low in BJT? (1.5)

(g) What is the relation between base current and collector current? (1.5)

(h) Draw the small signal model of MOSFET. (1.5)

(i) Why FET is called unipolar device? (1.5)

(j) What is etching in fabrication process? (1.5)

PART–B

2. (a) Draw the Fermi Dirac distribution function for intrinsic, N-type and P-type semiconductor. How this function depends on temperature? (9)

(b) Derive the expression for drift current and mobility in a semiconductor. (6)

3. (a) Explain the switching of P-N junction diode from forward to reverse bias in detail. (7)

(b) Explain the Avalanche and Zener breakdown mechanism on P-N junction. (8)

4. Derive the expression for the P-N junction diode current. (15)

5. (a) Draw and explain the input and output characteristic curve of CE configuration of BJT in detail. (9)

(b) Draw and explain the Ebers-Moll model for BJT. (6)

6. (a) Draw the Structure of n-channel Enhancement type MOSFET and explain its working. Also draw and explain its $I_d - V_{gs}$ and $I_d - V_{ds}$ characteristic curve. (10)

(b) What is channel length modulation and what is its effect? (5)

7. Explain the following terms of fabrication :

(a) Oxidation.

(b) Photolithography.

(c) Chemical vapor deposition. (15)