

Roll No.

Total Pages : 3

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)

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- (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)