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Total Pages : 3

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January, 2023
B.Tech.(ECE) IIIrd SEMESTER
Electronic Devices (EC-301)

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 each question maximum mark is 15.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART–A

1. (a) Define diffusion constant for holes and give its dimensions. (1.5)

(b) Write the equation for the net current in a semiconductor. What is the physical significance of each term? (1.5)

(c) Write the equation of diode. (1.5)

(d) Write the generalized transistor equation for Bipolar Junction transistor. (1.5)

(e) Compare the IV Characteristics of PN Junction diode for Ge and Si based diode. (1.5)

(f) Define volt equivalent of temperature. (1.5)

(g) What is the input resistance of MOSFET? (1.5)

(h) How the Channel resistance in MOSFET can be increased. Explain? (1.5)

(i) Explain upon what four parameters does the contact difference of potential depend? (1.5)

(j) Write three properties of silicon wafer. (1.5)

PART–B

2. (a) The equation of continuity is a mathematical statement of what physical law? The left hand side of this equation for holes is dp/dt. The right hand side of this contains several terms. State in words (no mathematics) what each of these terms represent physically. (8)

(b) For open circuited Bipolar Junction Transistor plot the minority concentration and potential distribution profile for *pnp* type of transistor. (7)

3. (a) Explain the breakdown mechanism in junction diodes in detail. (8)

(b) Compare the Common Base and Common emitter input and output characteristics for the Bipolar Junction Transistor. (7)

4. (a) A Si sample is doped with 10^{17} arsenic atoms/cm^3. (8)

(i) Find minority concentration at room temperature.

(ii) Find the location of the Fermi level with respect to the intrinsic Fermi level. (Given that n_i = 1.5×10^{10} electrons/cm^3).

(b) Write a short note on doping and diffusion process used in Integrated circuit fabrication. (7)

5. Explain construction and working of n-channel enhancement type MOSFET in detail. Plot its small signal equivalent model when operating in saturation region. (15)

6. Consider a step graded junction p-n junction with doping profile $N_A > N_D$. Then drive a mathematical relationship for charge density, field intensity and potential as a function of distance from the junction for reverse bias. (15)

7. (a) Explain the term Etching and its type for device fabrication.

(b) Define overdrive voltage and its significance in MOSFET operation.

(c) Find the location of Fermi energy level for intrinsic and extrinsic type of semiconductors. (5+5+5)