24/10/13. (2)

Roll. No.	

B.E / B.TECH (Full Time) DEGREE END SEMESTER EXAMINATIONS, OCT/NOV/DEC 2013

ELECTRONICS AND COMMUNICATION ENGINEERING

SECOND SEMESTER

EC 9151 – ELECTRON DEVICES

(REGULATION – 2008)

Time: 3 hours **Max.Marks: 100**

Answer ALL Questions

Part A – (10 x 2 = 20 Marks)

1. Calculate the peak electric field at a metallurgical junction having $x_n = 0.864 \times 10^{-6}$m, $N_d = 1 \times 10^{15}$, $\epsilon = 11.7$ and $\varepsilon_r = 8.854 \times 10^{-14}$ F/m ?
2. Define diffusion resistance of a PN junction.
3. Calculate the emitter injection efficiency of a transistor if $N_B/N_E = 302$.
4. What is meant by current crowding?
5. Determine the internal pinch off voltage of an N channel JFET with $a = 0.75 \times 10^{-4}$cm, $N_d = 10^{16}$ cm^{-3}, $\epsilon = 11.7$ and $\varepsilon_r = 8.854 \times 10^{-14}$ F/m.
6. Why does carrier mobility varies in MOSFET devices?
7. What do you understand by "electron affinity"?
8. Compare the material properties of GaAs and Silicon.
9. Give the principle of MOS gated thyristor.
10. What is the need for multi emitter transistor?

Part – B (5 x 16 = 80 Marks)

11.(i) Explain the basic structure of PN junction and derive an expression for built in voltage. (10)

(ii) Derive an expression for the electric field at the PN junction. (6)

12.a.(i) Discuss the current density components in an NPN bipolar transistor operating in the forward active mode with relevant diagrams. (10)

(ii) Deduce expressions for Emitter injection efficiency factor and base transport factor. (6)

(Or)

b.(i) Explain Ebers – Moll model in detail with necessary expressions for the current components. (12)

(ii) Compare the features of Ebers – Moll model with Gummel poon model. (4)

13.a.(i) Illustrate the variations in Gate to channel space charge regions and the corresponding characteristics, in a JFET. (8)

(ii) Derive the expressions for internal pinch off and Drain to source saturation voltage in a JFET. (8)

(Or)

b.(i) List the assumptions generally used for the derivation of the V – I characteristic equations of a MOSFET. (4)

(ii).Derive the ideal current – Voltage relation of a MOSFET. (12)

14.a.(i). Derive expressions for theoretical barrier height, built in potential and maximum electric field in a Metal Semiconductor diode. (8)

(ii) Explain the concept of image charge and electric field lines in a metal – dielectric interface, with relevant diagrams. (8)

(Or)

b.(i) With neat diagrams, explain the principle and operation of a Tunnel diode. (10)

(ii) Explain the V- I characteristics of a tunnel diode. (6)

15.a.(i) Discuss in detail about the structure and operation of a VMOS transistor. (10)

(ii) Outline the procedure for obtaining the safe operating Area in a Power MOSFET. (6)

(Or)

b.(i) Discuss the principle, structure and operation of a Charge coupled Device. (12)

(ii) Brief about the construction and operating characteristics of an opto coupler (4)