5

B. E. DEGREE END SEMESTER EXAMINATIONS, NOV. / DEC. 2011

SECOND SEMESTER – (REGULATIONS 2009)

EC 9151 – ELECTRON DEVICES

Time: 3 hrs. Max. Marks: 100

Answer **ALL** Questions

Part – A (10 × 2 = 20 Marks)

1. In semiconductors, conductivity increases with temperature, but in metals, conductivity decreases with temperature, Why?
2. What is diffusion current in a p-n junction diode?
3. How should the size and doping of collector, base and emitter of a BJT be chosen inorder to usc as a good amplifier?
4. What is early effect? How can it be avoided?
5. What is channel length modulation?
6. Define pinch-off voltage of JFET.
7. Give two semiconductor devices which have negative resistance region in its characteristics.
8. What is a varactor diode? Give one application.
9. Explain opto-coupler.
10. Explain charge coupled devices.

Part – B (5 × 16 = 80 Marks)

11. (a) (i) Explain the working of an n-channel JFET with neat schematic diagrams. Write the current expressions for different regions of operation of an n-channel JFET and explain the current-voltage characteristics. (10)

    (ii) Explain the drain characteristics of an n-channel enhancement MOSFET. (6)

12. (a) (i) Calculate the resistivity of (a) intrinsic silicon and (b) p-type silicon with $N_A = 10^{16}/cm^3$ and intrinsic carrier concentration $n_i = 1.5 \times 10^{10}/cm^3$. Given that for intrinsic silicon $\mu_n = 1350cm^2/Vs$ and $\mu_p = 450cm^2/Vs$ and for doped silicon $\mu_n = 1110cm^2/Vs$ and $\mu_p = 400cm^2/Vs$. (8)

    (ii) What is drift and diffusion current of a diode? Discuss the operation of p-n junction diode under forward and reverse biasing. (8)

OR

(b) (i) Explain the switching characteristics of a p-n junction diode? (8)

(ii) Explain with the help of energy band diagram, the built-in potential of a p-n junction diode. (8)

13. (a) (i) Draw the output characteristics of common-base and common-emitter configuration and indicate all regions of operation. Briefly explain the differences which can be observed in the characteristics of CB and CE configuration? (10)

(ii) Calculate the β for two transistors for which $\alpha = 0.99$ and 0.98. For collector currents of $10mA$, find the base currents of each transistor? (6)

OR

(b)(i) Draw the hybrid-π model of a common-emitter configuration. Derive the transconductance, voltage gain, input impedance and output impedance. (10)

(ii) A BJT having a $\beta = 100$ is biased at a dc collector current of 1 mA. Find the value of g_m, r_e and r_π? (6)

14. (a) Explain briefly: (4×4)

(i) MESFET (ii) Schottky Barrier Diode

(iii) Zener Diode (iv) LDR

OR

(b) Explain the various operating regions of tunnel diode with energy band diagram.

15. (a) Write brief notes on the following devices: (4×4)

(i) Unijunction Transistor (ii) Power MOSFETs

(iii) Diac (iv) Liquid Crystal Display

OR

(b) Write brief notes on the following devices: (4×4)

(i) Silicon Controlled Rectifier (ii) Traic

(iii) Light Emitting Diode (iv) DMOS

****