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B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2003.

Third Semester

Electrical and Electronics Engineering

EC 253 — ELECTRON DEVICES

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. An electron is injected perpendicularly into a uniform magnetic field of flux density 0.01 Wb/m^2 with an initial speed of 10^7 m/s. What will be the radius of the circular path that the electron describes?

2. An ideal Germanium diode has a reverse saturation current of 20 μA. Find the dynamic resistance for a forward bias of 0.1 V.

3. What is Hall effect? Give any two applications.

4. What are hybrid parameters?

5. Define diffusion current.

6. Give any two ways by which the transistors are protected from overheating due to high power operation.

7. What are the advantages of FETs?

8. Mention any two applications of SCR.

9. What is an optoelectronic coupler?

10. Draw the basic structure of a CRT.

PART B — (5 × 16 = 80 marks)

11. (i) Explain about magnetic deflection in a CRT. Derive the expression for deflection sensitivity. (10)

(ii) Find the speed of an electron after it has moved through a potential difference of 10,000 V. What would be the percentage change in its mass at this speed? (6)

12. (a) (i) Explain the origin of depletion layer capacitance and diffusion capacitance and discuss the importance of each. (8)

(ii) What is a Schottky diode? What is its application? (8)

Or

(b) (i) You are given two different Ge diodes with their data at forward bias as follows :

$V_{D(on)1}$ = 0.7 V at 10 mA

$V_{D(on)2}$ = 0.6 V at 0.1 mA.

If these diodes are placed in a series circuit and a current of 1 mA is made to flow in them (forward bias), what will be the sum of voltage drops across them? (8)

(ii) Explain with relevant diagrams, the function of a Zener diode. Mention its important applications. (8)

13. (a) (i) Draw the hybrid π model of a transistor in CE configuration and discuss about each component of the model. (10)

(ii) Draw the Ebers–Moll model for a *pnp* transistor. (6)

Or

(b) (i) With appropriate diagrams, discuss about various switching times of a transistor. (8)

(ii) Compare the three configurations of a transistor. (8)

14. (a) Explain the function of depletion type MOSFET.

Or

(b) (i) Describe the operation of UJT. What is its main application? (10)

(ii) Draw the low frequency small signal JFET model. (6)

15. (a) With neat sketches, discuss about the basic construction and operation of a laser diode. Name the different types of lasers.

Or

(b) What is a photo diode? With proper characteristic curves and relevant diagrams, explain the operation of the device. What are its applications?