Register Number: ……

B.E. DEGREE EXAMINATIONS: NOV/DEC 2010

Second Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

U07EC206: Electron Devices

Time: Three Hours **Maximum Marks: 100**

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks

1. When an electron enters in a uniform magnetic field, it travels along
   A) Straight line B) Circle C) ellipse D) Helix

2. The deflection produced in a CRT is proportional to
   A)V_d B) V_d^2 C)$(V_d)^{1/2}$ D) $1 / V_d$

3. The knee voltage of a diode is approximately equal to
   A) Applied voltage B) Barrier potential
   C) Breakdown voltage D) Forward voltage

4. When the diode is forward biased, the recombination of free electrons and holes may produce
   A) Heat B) Light C) Radiation D) All the above

5. A photo diode is normally
   A) Forward biased B) Reverse biased
   C) Neither forward nor reverse biased D) Emitting light

6. The varactor diode is usually
   A) Forward biased B) Reverse biased
   C) Unbiased D) Operating in the breakdown region

7. If the base current is 100 mA and the current gain is 30, the collector current is
   A) 300 mA B) 3.33 A C) 3 A D) 10 A

8. The input impedance of a JFET
   A) Approaches zero B) Approaches one
   C) Approaches infinity D) Is impossible to predict

9. The Diac is a
   A) Transistor B) Unidirectional device
   C) Three layer device D) Bidirectional device

10. The Triac is equivalent to
   A) Four-layer diode B) Two diacs in parallel
   C)A thyristor with a gate load D) Two SCRs in parallel.

PART B (10 x 2 = 20 Marks)

11. Define magnetic deflection sensitivity
12. State Mass Action Law.
13. Differentiate conductivity and mobility in a semiconductor.
14. Write the continuity equation of the diode.
15. State the effect of temperature on PN junction diodes.
16. Describe the working principle of LED.
17. State the relation among α, β and γ.
18. Compare BJT with JFET.
19. Distinguish UJT from BJT.
20. Which diode is called as hot carrier diode? Why?

PART C (5 x 14 = 70 Marks)

21. a) (i) Trace the path of an electron when it is exposed to perpendicular and magnetic fields (7)

(ii) Derive an expression for the electrostatic deflection sensitivity of a CRT. (7)

(OR)

b) (i) Sketch the energy band picture for (4)

1. Intrinsic material
2. N type semiconductor
3. N type semiconductor
4. Conductors

(ii) The spacing between anode and cathode in parallel plate diode is 5mm and the potential difference 200 volts. Calculate

- Velocity of the electrons on reaching the anode
- Time of flight cathode to anode
- Kinetic energy of the electron in joules on reaching the anode expressed in Joules

Under the following 2 conditions

(A) Zero initial velocity of the electron on emission and

(B) Velocity of emitted electron of 1.5×10^{6} metres / second in the direction of the anode. (10)

22. a) (i) Prove that Fermi level in an intrinsic semiconductor lies midway in the forbidden band. (7)

(ii) What is Hall Effect? Give the necessary derivations to explain the Hall Effect. (7)

(OR)

b) (i) Draw the energy band diagram of a PN junction diode and explain. (4)

(ii) How does the diode voltage at constant current vary with temperature. (6)

(iii) The diode current is 0.65 mA when the applied voltage is 450 mV and 20 mA when the applied voltage is 550 mV. Determine η. Assume $kT/q = 26mV$. (4)

23. a) (i) Write short notes on (7)

- Avalanche breakdown
- Zener breakdown

(ii) Justify how the varactor diode is used as a variable capacitor diode. (7)

(OR)

b) (i) Describe the tunneling effect in a tunnel diode and draw its corresponding current - voltage characteristic of a tunnel diode and indicate the negative resistance. (9)

(ii) Sketch and explain the energy band structure for a heavily doped p-n diode for forward bias which results in the peak tunneling current. (5)

24. a) (i) Compare the performance of transistor in three different configuration. (6)

(ii) Draw the Ebers-Moll model for a NPN transistor and drive an equation for emitter and collector current. (8)

(OR)

b) (i) Obtain the expression for drain current of the JFET device. (6)

(ii) With a neat diagram explain the working of (8)

(1) Enhancement mode MOSFET

(2) Depletion mode MOSFET

25. a) (i) Brief the problems that arises in the ordinary small signal diodes and explain how Schottky diode is used to overcome it. (11)

(ii) State the applications of Schottky diode. (3)

(OR)

b) (i) Give the construction and working of PNPN diode. Draw and discuss its volt-ampere characteristics. (6)

(ii) Draw a basic structure of UJT. Give the working of UJT. Define the term η. (8)

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