Code No.: 10013

FACULTY OF ENGINEERING

B.E. II/IV Year (ECE) I Semester (Supplementary) Examination, April 2006

ELECTRONIC DEVICES

Time : 3 *Hours*] [*Max. Marks* : 75

Answer **all** *questions in* Part A *and any* **five** *questions from* Part B.

Assume reasonable values of data wherever necessary.

Part A – (Marks: 25)

1. Define the term current density J. What is the expression for J in terms of electron density and velocity? 3
2. Define 'ripple factor' and % regulation in rectifiers. 2
3. Explain the term thermal 'runaway'. 3
4. What are the differences between MOSFET and JFET? 2
5. What are the differences between light emitting diode and liquid crystal display? 3
6. Compare CC and CE configuration of transistor. 3
7. How UJT can be used as a relaxation oscillator? 3
8. Explain gain bandwidth product of BJT and FET. 2
9. In the case of collector to base bias circuit, if $\beta = 40$, $R_C = 4.7$ kΩ and $R_B = 80$ KΩ, determine the value of stability factor S. 2
10. If α of a BJT is 0.99, determine its value of β. 2

Part B – (Marks: $5 \times 10 = 50$)

11. (a) Derive the expression for the trajectoy of an electron in uniform retarding field, when the initial velocity is making an angle 'θ' with the field. 5

    (b) A charged particle having thrice the charge and mass twice that of an electron is accelerated through a potential difference VA of 50 volts, before it enters a uniform magnetic field of flux density B of magnitude 0.02 webers/m^2 normally with the field find.

    (i) The velocity of charged particle between entering the field.

    (ii) Radius of the path

    (iii) Time of one revolution. 5

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12. (a) Explain the V-I characteristics of P-n junction diode. Derive the equation for diode current. 5

(b) In a P-N junction Ge diode, find the value of the voltage for which the reverse current I_O will reach 75% saturation value at the room temperature. 5

13. (a) Derive the relation between α and β parameters of CB and CE operated transistors. 5

(b) Sketch the profiles of majority and minority carrier currents in the base of an NPN transistor. Explain the transistor action with the help of these profiles. 5

14. (a) Derive the relationship between I_{DS}, I_{DSS} and V_{GS} in a JFET and plot the transfer characteristics. 5

(b) Explain how JFET acts as a voltage variable resistor at low VDS values. 5

15. (a) Draw the hybrid-π equivalent circuit of CE transistor at high frequencies. Derive expressions for the feedback conductance gb'c and output conductance gce. 5

(b) A junction transistor is to operate at the following operating point I_{CQ}= 2mA, V_{CEQ}= 20V and I_{BQ}= 20μA. The following values for this operating point are the specifications of the transistor. β_0 = 100, f_T = 50 MHz, c_{ob}= 3pf, h_{ie}= 1.4KΩ, $h_{re} = 2.5 \times 10^{-4}$, h_{oe} = 20 μ mhos. Determine the hybrid-π model parameters of the transistor. Assume that the operating temperature is 300° K. 5

16. (a) Draw the circuit of a bridge rectifier and compare its performance with a full wave rectifier circuit using a mains transformer with centre tapped secondary winding. 5

(b) No load output voltage for a rectifier with L-section filter is $2V_m/\pi$. Mention whether it is used with HWR or an FWR circuit. 5

17. (a) Draw the biasing circuits of MOSFET and explain. 5

(b) Draw the characteristics of a MOSFET and explain its modes and regions of operation. 5