B.A./B.Sc. (General) 5th Semester

(2122)

PHYSICS

Paper : B (Electronics & Solid State Devices-I)

Time Allowed : Three Hours]   **[Maximum Marks : 44**

Note :— Attempt **FIVE** questions in all, including Question No. 7 (Unit-III) which is compulsory and selecting **TWO** questions each from Units-I-II. Use of non-programmable calculator is allowed.

UNIT—I

1. (a) Discuss the principle and working of Cathode Ray Oscilloscope (CRO) using proper block diagram. How you can use it to measure time period, frequency and phases of electric signals ?

   (b) Calculate the value of applied forward voltage for a p-n junction diode if $I_s = 40\ \mu A$, $I = 5$ A and $e/kT = 50$.

   6,3

2. (a) What is a Zener diode ? Draw its volt-ampere characteristic. Distinguish between avalanche and Zener breakdown.

   (b) Explain detail about ideal voltage and current sources with suitable diagrams.   6,3

3. (a) Write down the principle and working of light emitting diodes (LEDs). How they are superior than other types of lamps ?

(b) Distinguish between direct and indirect semiconductor.

(c) A bipolar junction transistor has $I_B = 500$ μA, $\beta = 99$ and $I_{CO} = 500$ μA. Then calculate the collector current. 4,3,2

UNIT—II

4. (a) Explain the working of L-section filter with full wave rectifier. Show that the ripple factor is independent of load resistance.

(b) A minimum current of 3.2 mA passes through a Zener's diode having rating 14 V and 0.25 W. Then calculate the value of series resistance if it is connected with 12 V supple power supply. 6,3

5. (a) Explain the input, output and transfer characteristics of n-p-n transistor in common emitter configuration. What are the active, cut-off, saturation and break down regions in the output characteristic ?

(b) Deduce the relation between α and β parameters of a transistor. 6,3

6. (a) What do you understand by biasing of transistor ? Why there is necessity of biasing ? On what factor does the selection of operating point depend ?

(b) Calculate the current gain, voltage gain and power gain of a transistor used as amplifier in common emitter configuration. Given $R_L = 200\ \Omega$, $h_{ie} = 500\ \Omega$, $h_{fe} = 50$, $h_{re} = 2.5 \times 10^{-2}$ and $h_{oe} = 500 \times 10^{-5}\ \Omega^{-1}$. 6,3

UNIT—III

7. Attempt any **eight** parts :

(i) State Norton's theorem.

(ii) Why at high temperature, an extrinsic semiconductor behaves like intrinsic semiconductor ?

(iii) How does CRT convert an electric signal into a visual signal ?

(iv) What are the advantages of full-wave rectifier over half-wave rectifier ?

(v) Define static and dynamic resistance of a transistor.

(vi) What happens to Fermi level of semiconductor when temperature increases ?

(vii) What do you mean by thermal Runaway of transistor ?

(viii) Define Q-point of a transistor.

(ix) Why common emitter mode configuration is preferred over other configuration in amplifiers ?

(x) Why h-parameters are known as hybrid parameters ?

$1 \times 8 = 8$