**B.A./B.Sc. (General) 5ᵗʰ Semester**

**1128**

**PHYSICS**

**Paper—B : Electronics and Solid State Devices—I**

**Time Allowed : Three Hours]**     **[Maximum Marks : 22**

**Note :—** (1) Attempt *five* questions in all, selecting *two* questions from each of Unit-I and Unit-II.

(2) Unit-III is compulsory.

(3) Use of non-programmable calculator is allowed.

### UNIT—I

1. (a) Draw the block diagram of Cathode Ray Tube (CRT). What is the function of aquading coating necessary in (CRT) ? Draw the pattern observed on the screen of the cathode ray oscilloscope, when the phase difference between two signals of same frequency is (i) 45° (ii) 180°.     3

   (b) State Thevenin's theorem, explain with example. 1½

2. (a) Derive an expression for position of fermi level in an intrinsic semiconductor. How does its position change when acceptor atoms are added to a semiconductor ? What happens if its temperature is raised ?     3

   (b) A N-type semiconductor made up of germanium has resistivity 4 $\Omega$ cm and electron mobility 3200 cm$^2$/volt-sec. Find the donor concentration.     1½

3. (a) Explain principle and working of Light Emitting Diode (LED). Write any two applications of LED and explain why we prefer LEDs over conventional incandescent lamps. 3

 (b) The reverse bias saturation current for PN junction diode is 2 µA at 300 K. Determine its dynamic resistance at 125 mV forward bias. 1½

## UNIT—II

4. (a) Draw the circuit diagram of LC filter with full wave rectifier. Explain its working. Also derive the expression for its ripple factor. 3

 (b) Explain the working of voltage regulation circuit using zener diode. 1½

5. (a) Draw the input and output characteristics of common emitter n-p-n transistor. Explain active, saturation and cut off regions. 3

 (b) A transistor has $\alpha = 0.96$, leakage current 1.5 µA and collector current 0.845 mA. Find the emitter current and base current in transistor. 1½

6. (a) Define stability factor. Draw a collector to base bias circuit diagram and derive an expression for its stability factor. What are the disadvantages of this technique ? 3

 (b) A transistor in common base with $\alpha = 0.98$ gives reverse saturation current $I_{CBO} = 10$ µA. When used in CE mode, it gives the base current of 0.1 mA. Calculate its total collector current in CE mode. 1½

## UNIT—III

7. Attempt any *eight* questions :

   (i) What is the charge on n type semiconductor ?

   (ii) What is zener breakdown ? What is its cause ?

   (iii) What is the negative clipper ?

   (iv) What do you understand by load line ?

   (v) What is the advantage of bridge rectifier over conventional full wave rectifier ?

   (vi) Describe the action of the inductor filter and its limitations.

   (vii) Why BJT is called current controlled device ?

   (viii) Why is capacitor filter preferred than the inductor filter ?

   (ix) What is the leakage current in a transistor ?

   (x) Why is the width of the base regions of a transistor very small ?                     $\frac{1}{2} \times 8 = 4$