(i)   **Printed Pages : 4**   Roll No. ....

(ii)   **Questions   : 7**   **Sub. Code :** $\boxed{1}\boxed{7}\boxed{4}\boxed{4}\boxed{9}$

Exam. Code : $\boxed{0}\boxed{0}\boxed{0}\boxed{5}$

B.A./B.Sc. (General) 5ᵗʰ Semester

(2124)

PHYSICS

Paper B : Electronics & Solid State Devices—I

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

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

(ii)   Unit III is compulsory.

(iii)   Use of a non-programmable calculator is allowed.

UNIT—I

1.   (a)   Draw the block diagram of the Cathode Ray Oscilloscope. Write down its principle, working, and uses in detail.   6

(b)   Explain how a voltage source can be converted into a current source.   3

2.   (a)   Obtain an expression for the depletion width of p-n junction diode. What happens to the width layer when the diode is forward or reverse-biased ?   6

(b) What is donor concentration in n-type Ge of 10^{-2} Ω m resistivity at 300 K ? Given $\mu_e = 0.39$ m^{2}V^{-1}s^{-1}. 3

3. (a) Show that at absolute zero temperature, the Fermi level of a semiconductor lies exactly at the middle of the top of the valence band and bottom of the conduction band. What happens to the Fermi level when the temperature increases ? 6

(b) Find the static and dynamic resistance of a p-n germanium junction for an applied bias v of 0.6 V at 300 K. Given $I_s = 1.2$ μA, k = 1.38×10^{-23} JK^{-1}. 3

UNIT—II

4. (a) Draw the circuit diagram of the LC filter with a full wave rectifier. Explain, its working. Also, derive the expression for its ripple factor. 6

(b) A load of 5kΩ is connected across the output of a full wave rectifier and each diode has a resistance of 400 Ω. If $E_m = 300$ V, find :

(i) Maximum current across the load.

(ii) Rectification efficiency.

(iii) Ripple factor. 3

5. (a) Define load line and Quiescent-point of a transistor amplifier. How will you draw a load line on the output characteristics of a transistor and what is its importance ? 6

(b) In a power supply, the output voltage drops from 50 V with no load to 48 V at full load. Calculate the percentage of voltage regulation. 3

6. (a) Draw the diagram of a common emitter amplifier and its equivalent circuit in terms of h-parameters. Derive the expression for the current gain, voltage gain, and input resistance. 6

(b) Show that the output signal is in phase with the input signal in a common base circuit. 3

UNIT—III

7. Attempt any *eight* questions :

(a) Why do we prefer LED's over conventional incandescent lamps ?

(b) Does the operating point of the transistor amplifier shift with temperature ?

(c) What is PIV of half wave rectifier ?

(d) Difference b/w transition and diffusion capacitance ?

(e) What is the knee voltage for Silicon and Germanium diode ?

(f) State Norton's Theorem ?

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

(h) What is leakage current ?

(i) Why BJT is called current controled device ?

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

$8 \times 1 = 8$