

2031
M.Sc. (Physics)
First Semester
PHY-8014: Electronics – I

Time allowed: 3 Hours

Max. Marks: 60

NOTE: Attempt five questions in all, including Question No. 9 (Unit-V) which is compulsory and selecting one question each from Unit I - IV.

x-x-x

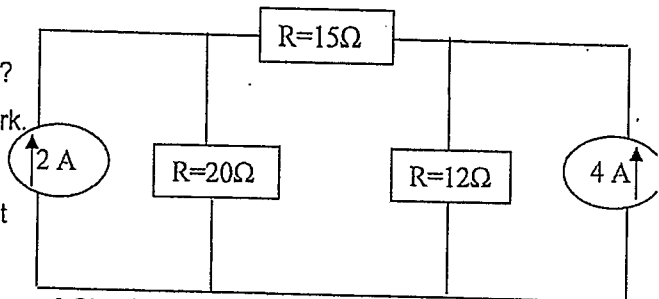
Unit – I

- 1.(a). Explain the concept of growth of semiconductor crystals. Discuss in detail the fabrication process for the formation of P-N junction and finally the existence of the depletion layer.
- (b). What is the difference between the direct and indirect semiconductors in the solid state electronics? What is the link of light emitting diodes to any of these semiconductors?
2. Explain the construction details of Gunn diode as a high frequency device, with the help of a suitable diagram. Also explain the I-V characteristics for this high frequency device. Discuss how this different from IMPATT diode working in the high frequency applications.

Unit – II

3. Explain the working of the High Pass Filter network using circuit diagram by calculating the Characteristic Impedance. Also draw the circuit diagram and output waveform for the High Pass Filter network. Show the cut-off frequency points in the waveform plots of the circuit.

- 4.(a). What is Thevenin Theorem in electronic circuits?
Explain with the help of a simple resistive network.
- (b). By using Nodal Analysis, determine the voltage across the $15\ \Omega$ resistor as shown in the circuit



Unit – III

- 5.(a). What is the Instrumentation Amplifier using operational amplifier? Why it is so called? Draw and explain this configuration amplifier. Also discuss some of its applications in detail with the help of some examples.
- (b). Design an adder circuit using an OpAmp to get the output expression as
$$V_o = -(0.1 V_1 + V_2 + 10 V_3)$$
 where V_1 , V_2 and V_3 are the inputs.
6. (a). Design the basic internal circuit of IC Op-amp configuration. Also explain its components' role.
- (b). What is Propagation delay in the comparators of an Op-amp configuration. Explain how this Propagation delay can be measured in the comparators.

Unit - IV

7. Discuss the three modes of operation for Silicon Controlled Rectifier, while discussing the I-V characteristics. The trigger circuit of an SCR has a source voltage of 15V and the load line has a slope of $(-120)\text{ V per Ampere}$. The minimum gate current to turn-on the SCR is 15mA. Calculate the trigger voltage and trigger current for an average gate power dissipation of 0.4 watts.
8. Write short notes on the followings:
(6 marks each)
 - (a). Difference in working of Amplitude shift keying system and Frequency shift keying system,
 - (b). Satellite Communication Systems.

(12 x 4 = 48).

P.T.O.

(2)

UNIT - V

9. Attempt all questions:

- (a). What is the significance of position of Fermi level in semiconductor material analysis?
- (b). What is the meaning of **Slew rate** in OpAmp based circuit?
- (c). Why uplink and downlink frequencies are always different in mobile communication systems?
- (d). What is the meaning of the term '**LASCR**'?
- (e). Explain the difference between **Hybrid matrices** and **Transmission matrices**.
- (f). What is the significance of location of poles in circuit analysis?

(6x2)

x-x-x