Reg No.: _____ Name : _____

Jyothi Engineering College(Autonomous)

B.Tech Degree S1 (R) Examination, December 2025 (2025 Scheme)

25PHT102- PHYSICS FOR ELECTRICAL SCIENCE

Total Mark: 60 Total Time: 2hrs 30 min

CO: MARK

PART A

(Answer All Questions. Each question carries 3 marks)

1.	Why does the current increase rapidly in a diode when the forward bias voltage exceeds a certain value?	CO1 (3)
2.	Explain the factors affecting the density of holes in the valence band.	CO1 (3)
3.	Define stringing of solar cells.	CO2 (3)
4.	Calculate the wavelength of radiation emitted by an LED made up of GaAs with band gap energy 1.43 eV.	CO2 (3)
5.	Discuss any three applications of superconductivity.	CO3 (3)
6.	How does the resistivity of a super conductor depend on temperature?	CO3 (3)
7.	Calculate the numerical aperture of an optical fibre whose cladding refractive index is 1.40 and core refractive index is 1.48.	CO4 (3)
8.	Discuss any three differences between spontaneous emission and stimulated emission.	CO4 (3)

PART B

(Answer any one full question from each module, each question carries 9 marks)

Module - 1

9. a)	Show that the fermi energy level in an intrinsic semiconductor lies exactly at the middle of energy band gap.	CO1 (5)
b)	A germanium diode at room temperature has a forward current of 2 mA when the forward voltage across it is 0.3V. Assuming the ideal diode equation and kT = 0.026eV, calculate the reverse saturation current of the diode.	CO1 (4)

OR

10. a)	With a neat energy band diagram, explain the formation of a p–n junction under equilibrium conditions.	CO1 (5)
b)	A silicon diode is forward biased with a voltage of 0.5 volt at 298 K. The reverse saturation current is found to be 10 nA. Find the diode current.	CO1 (4)

Module - 2

11. a)	With the help of a labelled diagram, explain how a centre-tap full-wave rectifier converts AC into DC.	CO2 (5)
b)	List and explain any four applications of a junction photodiode.	CO2 (4)

OR

12. a) Explain the working of a Zener diode with a neat V–I characteristic diagram. CO2 (5)

b) A crystal diode having internal resistance 20Ω is used for half wave rectification. If the applied voltage V = 50 sinωt and a load resistance 800Ω, find (a) dc output current (b) ac input power (c) dc output power and (d) efficiency of rectification. CO2 (4)

Module - 3

13. a) Distinguish between soft and hard super conductors with appropriate diagrams. CO3 (5)

b) The transition temperature for Pb is 7.26 K. The maximum critical field for Pb is $8 \times 10^5 A/m$. If it has to be used as a superconductor subjected to a magnetic field of $4 \times 10^4 A/m$, what should be the temperature of Pb. CO3 (4)

OR

14. a) Derive the relation between polarization and dielectric constant. CO3 (5)

b) The electric susceptibility of medium is 950×10^{-11}. Compute the permittivity and relative permittivity. CO3 (4)

Module - 4

15. a) What are the basic components of a laser system? What method is used to achieve population inversion in a semiconductor laser? CO4 (5)

b) Mention the advantages and disadvantages of ruby laser. CO4 (4)

OR

16. a) How does a step-index fiber differ from a graded-index fiber? Explain wave propagation through each of them. CO4 (5)

b) With the help of a block diagram, describe the working of a fiber optic communication system. CO4 (4)

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