H.T.No: | | | | | | | | | | | Course Code: **241PH002**

ADITYA UNIVERSITY

B.Tech – I Semester End Examinations Regular – Dec 2024

MODERN PHYSICS
(Common to EEE, ECE, IT & CSE(DS))

Time: 3 hours **Max. Marks: 50**

Answer ONE question from each unit
All Questions Carry Equal Marks
All parts of the questions must be answered at one place only

UNIT-I

1	a	Explain how different types of interference arise from the principle of superposition.	L1	CO1	[2M]
	b	Derive the conditions for dark and bright intensity in the formation of Newton's rings in the case of reflected monochromatic light.	L2	CO1	[8M]
		(OR)			
2	a	Explain the difference between Fresnel and Fraunhofer diffraction.	L2	CO1	[3M]
	b	Explain the theory of Fraunhofer diffraction for a single slit and derive the conditions for the occurrence of primary and secondary maxima.	L2	CO1	[7M]

UNIT-II

3	a	Explain the characteristics of laser beam.	L1	CO2	[2M]
	b	Describe with neat diagrams, construction, working and energy level diagram in the case of He-Ne laser.	L2	CO2	[8M]
		(OR)			
4	a	What is acceptance cone? Derive an expression for acceptance angle of an optical fibre.	L1	CO2	[8M]
	b	An optical fibre has an acceptance angle of 30° then find its numerical aperture?	L3	CO2	[2M]

UNIT-III

5	a	Explain in detail on the properties of the wave function.	L1	CO3	[2M]
	b	Derive time independent Schrodinger wave equation.	L2	CO3	[8M]
		(OR)			
6	a	Estimate the energy of second excited state of an electron which is trapped in one-dimensional box of width 1 Å. (mass of the electron is 9.1×10^{-31} kg).	L3	CO3	[2M]
	b	Show that the energy of the particle is quantized and derive wave function in one dimensional potential box.	L2	CO3	[8M]

UNIT-IV

7	a	Explain details in quantum free electron theory with merits and demerits.	L2	CO4	[6M]
	b	What is the Fermi-Dirac distribution function?	L2	CO4	[4M]
		(OR)			
8	a	What is the significance of the Bloch theorem in the band theory of solids?	L2	CO4	[2M]

(P.T.O)

	b	Discuss the origin of energy bands in crystalline solids and classify solids based on their band structures.	L2	CO4	[8M]

UNIT-V

9	a	Explain the concept of the Fermi level in semiconductors.	L2	CO5	[3M]
	b	What is Hall effect. Derive an expression for Hall Coefficient.	L2	CO5	[7M]

(OR)

10	a	What is the difference between P-type and N-type semiconductors?	L2	CO5	[3M]
	b	Describe the working of a PN junction diode and explain the characteristics of a Zener diode.	L2	CO5	[7M]

*****