Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech - END SEMESTER EXAMINATIONS, May 2025

Common to All Branches
First Semester
PH5151& Engineering Physics
(Regulation 2019)

Time: 3hrs

Max.Marks: 100

CO 1	To make the students in understanding the importance of mechanics
CO 2	To equip the students on the knowledge of electromagnetic waves.
CO 3	To introduce the basics of oscillations, optics and lasers.
CO 4	To enable the students in understanding the importance of quantum physics.
CO 5	To elucidate the application of quantum mechanics towards the formation of energy bands in crystalline materials.

BL – Bloom's Taxonomy Levels
(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)
(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	With an example explain the conservation of angular momentum.	2	1	L1
2	Calculate the moment of inertia of a solid sphere of mass 1 kg and radius 50 cm about its diameter.	2	1	L3
3	Write any two properties of electromagnetic waves.	2	2	L4
4	Electric field of plane electromagnetic wave is 450 N/C. Find the magnetic field in a wave.	2	2	L2
5	List few differences between standing waves and travelling waves.	2	3	L2
6	What is meant by total internal reflection?	2	3	L2
7	Calculate the de Broglie wavelength of an electron accelerated by an electric potential of 500 V.	2	4	L2
8	What are matter waves?	2	4	L3
9	What is meant by tunneling effect?	2	5	L2
10	State Bloch's Theorem.	2	5	L1

PART- B (5 x 13 = 65 Marks)

Q. No	Questions	Marks	CO	BL
11 (a) (i)	Does the centre of mass of a body necessarily lie inside the body? Explain with an example.	4	1	L2
(ii)	Find the expression for moment of inertia of a solid cylinder about an axis passing through its centre and perpendicular to its plane	9	1	L4
	OR			
11 (b) (i)	Discuss the rotational energy states of a rigid diatomic molecule.	4	1	L2
(ii)	Give the theory of Torsion pendulum and based on that derive an expression for period of oscillation.	9	1	L4
12 (a)	Write down Maxwell's equations in differential form and hence derive the plane electromagnetic wave equation in a vacuum.	13	2	L3
	OR			
12 (b)	Explain the production of electromagnetic waves in detail with	13	2	L3

	necessary figures and discuss about the cell phone reception.			
13 (a) (i)	Deduce the wave equation for a plane progressive wave on a string.	**10**	3	L3
(ii)	A train blowing a 200 Hz whistle is moving toward a stationary observer at 50 m/s. When the observer is running toward the train at 2 m/s, find the frequency heard by the observer.	**3**	3	L5
	OR			
13 (b) (i)	With necessary theory derive an expression for the diameter of a thin wire in Air-wedge experiment.	**10**	3	L3
(ii)	Monochromatic light of wavelength 5896Å is incident normally on a wedge shaped film of refractive index 1.5. The distance between the successive interference fringes is 2mm. Find the angle of the wedge.	**3**	3	L5
14 (a) (i)	Derive Schrodinger time dependent and dependent wave equation for matter waves.	**9**	4	L4
(ii)	Give the physical significance of wave function.	**4**	4	L5
	OR			
14 (b) (i)	Solve Schrodinger time independent wave equation for a particle in a one dimensional potential well .	**9**	4	L4
(ii)	Explain briefly correspondence principle.	**4**	4	L5
15 (a)	Discuss about quantum mechanical treatment of a harmonic oscillator.	**13**	5	L4
	OR			
15 (b)	Using suitable mathematical expressions explain Kronig-Penny model for the energies of an electron in a metal.	**13**	5	L4

PART- C (1 x 15 = 15 Marks)

(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16. (i)	Explain the working of CO_2 Laser using energy level diagram.	**11**	3	L4
(ii)	What is the wavelength of light emitted when the electron jumps from n=3 to n=1, when it is trapped in a box of size 1 A^0?	**4**	4	L5