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

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APR / MAY 2025

Common to all branches

Second Semester

PH23C01 & Engineering Physics

(Regulation2023)

Time:3hrs | Max.Marks: 100

CO1	Understanding the significance of crystal structure and bonding. Learn to grow crystals
CO2	Obtain knowledge on important mechanical and thermal properties of materials and determine them through experiments.
CO3	Conceptualize and visualize the oscillations and sound
CO4	Grasp optical phenomenon and their applications in real life
CO5	Appreciate and evaluate the quantum Phenomenon

BL – Bloom's Taxonomy Levels

(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A(10x2=20Marks)

(Answer all Questions)

Q.No.	Questions	Marks	CO	BL
1	What are the various types of bonding in crystals? What type of bonding is present in graphite?	2	1	L1
2	Draw the crystal planes for (101) & (111) in a cubic system	2	1	L2
3	Distinguish translational and rotational motions	2	2	L2
4	What is known as terminal velocity?.	2	2	L2
5	What is forced oscillation and resonance?	2	3	L1
6	Steel is coated with thin layer of ceramics to protect against corrosion. What do you expect to happen to the coating when the temperature of the steel is increased significantly?	2	3	L2
7	What is the source of colors seen on the surface of a CD?	2	4	L2
8	Why do we need fiber optic communication system?	2	4	L2
9	What is black body radiation? Give an example	2	5	L1
10	What do you understand by quantum tunneling?	2	5	L2

PART- B(5x 13=65Marks)

(Restrict to a maximum of 2 subdivisions)

Q.No.	Questions	Marks	CO	BL
11 (a)	(i) Define packing factor. Obtain the packing density for BCC and FCC lattices.	9	1	L1,L5
	(ii) What are the various defects present in crystals? Describe the Schottky defect and grain boundary	4	1	L2
	OR			
11(b)	(i) Explain the Czochralski method of growing crystals. Mention its advantages and limitations.	9	1	L3
	(ii) State Bragg's law. Calculate the separation of the sets of planes which produce strong X-ray diffraction beams at angles 4° and 8° in the first order, given that the X-ray wavelength is 0.1 nm	4	1	L1,L3
12 (a)	(i) Derive the expressions for moment of inertia of a hollow cylinder about its own axis and about an axis passing through the center & perpendicular to its own axis.	10	2	L4
	(ii) Describe the Stress-Strain diagram of a ductile material.	3	2	L2

	OR			
12 (b)	(i) State Hook's law. How can you determine the Young's modulus of a given uniform rectangular bar using non-uniform bending method?	10	2	L1,L5
	(ii) What are the advantages of I-shaped girders?	3	2	L2
13 (a)	(i) What is Simple Harmonic Motion? Derive the expression for average linear energy density from energy transfer of a wave in a string?	9	3	L1,L4
	(ii) A metal disc of 0.1 m radius and mass of 1 kg is suspended in horizontal plane by a vertical wire attached to its center. If the diameter of the wire is 10^{-3} m, its length is 1 m and period of torsional oscillation is 4 sec, find the rigidity modulus of the wire.	4	3	L3
	OR			
13 (b)	(i) Why ultrasound is not audible to human ear? Describe various scanning methods used in the field of medical imaging	9	3	L2,L4
	(ii) What is threshold of intensity level? If a person in the stands of an auditorium shouts, the intensity level at the center of the stadium is 50 dB. What is the intensity level when 20,000 people are shouting roughly from the same distance?	4	3	L1,L3
14 (a)	(i) What is interference? With necessary diagram explain the working principle, fringe pattern and theory to determine the wavelength of a monochromatic source of light using Michelson's interferometer	10	4	L2,L3
	(ii) A wedge shaped air film is produced when a fine wire of diameter D is placed between the ends of two optically flat glass plates of length 20×10^{-2} m. When the air film is illuminated with a light of wavelength $\lambda=550 \times 10^{-9}$ m, there are 12 dark fringes per centimeter. Find the diameter D of the fine wire.	3	4	L3
	OR			
14 (b)	(i) What is population inversion? Describe with necessary schematic & energy level diagram about the construction and working principle of CO_2 laser. Also list out its medical applications.	10	4	L2,L4
	(ii) A silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and a cladding refractive index of 1.47. Determine (a) the critical angle (b) the Numerical aperture (c) the acceptance angle.	3	4	L3
15 (a)	(i) Derive the one dimensional time independent Schrodinger wave equation.	10	5	L4
	(ii) Calculate the de-Broglie wavelength for a proton moving with a speed of 1×10^{6} m/s ($m= 1.67 \times 10^{-27}$ kg)	3	5	L3
	OR			
15 (b)	(i) Derive the expression for energy levels of a particle in a one dimensional box of width 'a' and infinite height.	10	5	L4
	(ii) Mention the physical significance of wave function	3	5	L1

PART- C(1x 15=15Marks)

(Q.No.16 is compulsory)

Q.No.	Questions	Marks	CO	BL
16.	(i) What is Doppler effect? Describe with necessary schematic diagram a technique to determine the velocity of blood flow.	8	3	L2,L5
	(ii) With necessary schematic diagram, explain the working principle of tunneling microscope.	7	5	L4