CHENNAI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University, Chennai)
CHENNAI - 600 069

B.E. / B.Tech. DEGREE END SEMESTER EXAMINATIONS
NOV / DEC 2024
First Semester
PH4101 – ENGINEERING PHYSICS
(Common to ALL Branches)
(Regulations 2024)

Time: Three Hours | Maximum Marks: 100

Answer ALL Questions

RBT Level : L1- Remembering, L2 – Understanding, L3 – Applying, L4 – Analyzing, L5 – Evaluating, L6 – Creating

PART – A (10x2=20 Marks)	CO	RBT Level
1. Define bending moment of a beam.	CO1	L2
2. Sketch the stress-strain diagram for a ductile material.	CO1	L2
3. A quartz crystal of thickness 0.001 meter vibrates in its fundamental frequency. Calculate its frequency. Given that Young's modulus of the material of the crystal is 79GPa and density is 2650 kg/m^3.	CO2	L
4. Mention the advantage of C scan in the non-destructive testing.	CO2	L2
5. Comment about the population inversion.	CO3	L2
6. What is the role of He during the operation of a CO_2 laser?	CO3	L1
7. Justify, that model dispersion will happen only in multimode optical fibers.	CO4	L1
8. Mention the advantages of optical fibers in computes.	CO4	L
9. List any two postulates of Planck's quantum theory.	CO5	L
10. Differentiate between bits and qubits.	CO5	L

PART - B (5x16=80 Marks)	CO	RBT Level
11. a) i) Define moment of inertia. Find the moment of inertia for a solid circular disc rotating with respect to center of mass and diameter.	CO1	L2
ii) A brass circular disc of mass 7 kg having a radius 0.9 m is made to spin at an angular speed of 35 rad/s about an axis passing through the center of mass. Calculate the moment of inertia.	CO1	L3

(OR)

b) i) Derive an expression for rigidity modulus of the material of a thin wire using torsion pendulum. CO1 L2 (12)

ii) A wire of length 1.65 m, and radius 0.8 mm clamped at one end and connected to a torsional pendulum at the other. The moment of inertia of the pendulum is 0.05 kgm^2, and the time period of oscillation is measured to be 3.5s. Determine the rigidity modulus of the wire. CO1 L3 (4)

12. a) i) Explain the factors affecting acoustics of buildings and discuss their remedies. CO2 L2 (12)

ii) A hall of volume 1000 m^3 is found to have a reverberation time of 2 seconds. If the area of the sound absorbing surface is 350 m^2, calculate average absorption coefficient. CO2 L3 (4)

(OR)

b) i) What is an X cut crystal? Employing these crystals explain the principle, construction and working of a piezoelectric oscillator. CO2 L2 (12)

ii) The density of the pure iron rod is 7.25×10^3 kg/m^3 and has a Young's modulus of 123×10^9 N/m^2. If the length of the rod is 52 mm, calculate its natural frequency. CO2 L3 (4)

13. a) i) Describe the absorption and emission processes which happens in a laser and derive the relationship between the Einstein's A and B coefficients. CO3 L2 (12)

ii) Calculate the number of photons from yellow light of mercury (λ =5893Å) requires to do one joule of work. CO3 L3 (4)

(OR)

b) i) Differentiate between the homojunction and heterojunction semiconductor laser with necessary diagrams and graphs. CO3 L2 (12)

ii) Calculate the Wavelength of radiation emitted by an LED made up of a semiconducting material with band energy 2.8eV. CO3 L3 (4)

14. a) i) Derive an expression for the numerical aperture and acceptance of an optical fiber. CO4 L2 (10)

ii) If the numerical aperture of an optical fiber is 0.27 having a refractive index difference of 0.018, Calculate the refractive indices of core and cladding material of the fiber. CO4 L2 (6)

(OR)

b) i) Describe the fiber optic communication system with suitable block diagram and explain its advantages. CO4 L2 (10)

ii) Discuss the principle and working of a pressure senor employing optical fiber for a practical application. CO4 L2 (6)

15. a) Derive time independent Schrodinger wave equation and hence deuce the time dependent Schrodinger wave equation. CO5 L2 (16)

(OR)

b) Derive an expression for the change in wavelength of an X-ray photon when it collides with an electron. CO5 L2 (16)