

Reg. No.

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**B.E./ B.TECH. DEGREE EXAMINATIONS, MAY 2023**

First Semester

**PH22151 – APPLIED PHYSICS***(Common to AD, CS, EC, EE, IT)***(Regulation 2022)****TIME: 3 HOURS****MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Develop an understanding about photonics and Fiber Optic communication system	3
CO 2	Acquire the knowledge of Quantum mechanics	4
CO 3	Classify and demonstrate the fundamentals of crystals and their defects.	3
CO 4	Gain knowledge in waves and oscillations	3
CO 5	Enable to explore the theory of electromagnetic waves and its propagation	4

**PART- A(20x2=40Marks)***(Answer all Questions)*

	CO	RBT LEVEL
1. Clarify the light amplification in the absence of stimulated emission?	1	2
2. Mention the modes of CO <sub>2</sub> vibrations performed in the laser.	1	2
3. A Silica Optic fiber has a core refractive index of 1.55 and clad refractive index of 1.50. Calculate the value of Numerical Aperture.	1	3
4. How do you calculate attenuation in optic fiber?	1	2
5. Arrive at Wien's displacement law from Planck's theory.	2	3
6. Calculate de-Broglie wavelength associated with an electron which is accelerated through a potential of 10 kV?	2	3
7. Potential energy of the particle in a box is zero-Justify.	2	2
8. Infer about Fermi distribution function.	2	2
9. Identify the lattice parameters of orthorhombic crystal system.	3	3
10. Compare single crystals with polycrystals.	3	2
11. Calculate the interplanar spacing for the (101) plane in a simple cubic lattice whose lattice constant is 4.2 Å.	3	3
12. State the significance of Burger vector.	3	2
13. Give reasons for the energy dissipation in the case of a damped oscillator.	4	2
14. Identify quality factor in waves and oscillations.	4	2
15. Distinguish between travelling waves and standing waves.	4	2
16. How forced oscillations differ from harmonic oscillations?	4	2
17. Write the significance of vector potential in EM wave propagation.	5	2
18. State Gauss divergence theorem.	5	2
19. Enlist any four applications of Maxwell's equations.	5	2
20. Are electromagnetic waves are mechanical waves? Justify	5	3

**PART- B (5x 10=50Marks)**

		Marks	CO	RBT LEVEL
21. (a)	Construct CO <sub>2</sub> laser and analyse its working principle with energy level diagram.	(10)	1	3
<b>(OR)</b>				
(b)	Classify different types of optic fiber on the basis of modes and refractive index.	(10)	1	3
22. (a)	Derive an expression for the change in wavelength of an X-ray photon when it collides with an electron.	(10)	2	4
<b>(OR)</b>				
(b)	Arrive at Schrodinger time independent and time dependent wave equation.	(10)	2	4
23. (a)	Brief about Miller indices and derive an expression for inter-planar spacing between two adjacent planes in a cubic lattice.	(10)	3	3
<b>(OR)</b>				
(b)	Show that FCC systems are closely packed than BCC systems.	(10)	3	3
24. (a)	Derive an expression for the particle velocity and obtain the differential equation of the travelling waves.	(10)	4	3
<b>(OR)</b>				
(b)	Compare and contrast the analogies between mechanical and electrical oscillating system with examples.	(10)	4	3
25. (a)	(i) Explain Poynting vector and derive an expression for Poynting theorem.	(5)	5	4
	(ii) Brief about the physical concept of electromagnetic energy density.	(5)	5	4
<b>(OR)</b>				
(b)	Using the laws of electromagnetism derive expressions for Maxwell's four general equations both in differential and integral form.	(10)	5	4

**PART- C (1x 10=10Marks)**

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	Apply your knowledge of atomic transitions, evaluate the conditions for stimulated emission and arrive the relations between Einstein's coefficients A and B.	(10)	1	5

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