Register Number:……..

KUMARAGURU college of technology
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B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2024

(Regulation 2024)

First Semester

COMMON TO AI&DS / CSE / IT

24PHI101: Applied Physics for Computing

COURSE OUTCOMES

CO1: Apply wave behaviour in optics and demonstrate its applications in real-world technologies.

CO2: Apply quantum mechanics principles and state their application in quantum information systems.

CO3: Apply the principles of qubits and quantum gates to demonstrate the advantages of quantum computing.

CO4: Apply the principles of heat transfer mechanisms for effective thermal management in engineering applications.

CO5: Apply vectors and moments to equilibrium problems in distributed force systems with free body diagrams.

CO6: Analyse and interpret acoustic principles to assess sound quality and design strategies for effective noise control in real-time applications.

Time: Three Hours **Maximum Marks: 100**

PART A (4 * 20 = 80 Marks)
Answer all the Questions

1.	a)	Differentiate between the phenomenon of reflection and refraction.	2	CO1	[K_1]
	b)	How does stimulated emission differ from spontaneous emission?	2	CO1	[K_2]
	c)	**Scenario:** A smart infrastructure development team is utilizing advanced technologies for building a digital twin of an airport. The team integrates CO_2 laser systems, optical fiber communication networks, and LiDAR technology to perform various tasks such as precision cutting, high-speed data transmission, and 3D modeling. These technologies collectively support the creation of accurate digital replicas and improve the operational efficiency of modern airport systems. c) Explain the working principle of CO_2 laser systems and their significance in	6	CO1	[K_3]

		precision cutting for creating components used in building the digital twin infrastructure.			
	d)	Describe how meridional and skew rays play a role in ensuring reliable high-speed data transmission through multimode optical fibers for the airport's digital communication system.	6	CO1	[K_3]
	e)	Discuss the working and importance of LiDAR technology in creating a 3D model of the airport runway to enhance monitoring and maintenance systems.	4	CO1	[K_3]
2.	a)	What is the role of thermal insulators in heat management systems?	2	CO4	[K_2]
	b)	Define thermal expansion and give one practical example.	2	CO4	[K_2]
	c)	Derive the general expression for steady-state rectilinear heat conduction through a plane slab. Discuss its assumptions and limitations.	6	CO4	[K_3]
	d)	Analyze the role of heat exchangers in thermal systems. Provide an application**.**	6	CO4	[K_3]
	e)	Explain the working principle of bimetallic strips in thermal sensors.	4	CO4	[K_2]
3.	a)	Define equilibrium of a body under a 2D force system.	2	CO5	[K_1]
	b)	Define free-body diagram and explain its importance in solving force problems.	2	CO5	[K_2]
	c)	State and explain the parallel-axis theorem for calculating moments of inertia.	8	CO5	[K_3]
	d)	State and explain the Work-Energy Theorem. Derive the relationship between work and change in kinetic energy.	8	CO5	[K_3]
4	a)	How loudness is calculated?	2	CO6	[K_1]
	b)	Provide an example of superposition waves.	2	CO6	[K_2]
	c)	What is Reverberation time and derive an expression for absorption coefficient in materials?	8	CO6	[K_3]
	d)	Explain the factors affecting the acoustics of buildings and the remedies to improve acoustics.	8	CO6	[K_3]

Answer any ONE Question
PART B (1 x 20 = 20 Marks)

5.	a)	State the wave-particle duality with an example.	2	CO2	[K_1]
	b)	Analyze the advantage of quantum computing over classical computing.	6	CO3	[K_3]
	c)	Derive an expression for a particle in a 1D box.	8	CO2	[K_2]
	d)	Explain the CNOT gate and its significance in quantum computing.	4	CO3	[K_3]
		OR			
6.	a)	State Heisenberg's uncertainty principle and describe its physical significance.	2	CO2	[K_1]
	b)	Compare quantum bits and classical bits.	2	CO3	[K_2]
	c)	Examine the significance of Qubits in Quantum information processing.	8	CO2	[K_3]
	d)	Discuss how quantum confinement leads to discrete energy levels in quantum dots and its significance in nanotechnology applications.	8	CO3	[K_3]

CO distribution summary:

	CO1	CO2	CO3	CO4	CO5	CO6
Marks (%)	20	10	10	20	20	20

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