



B.E/B.TECH DEGREE EXAMINATIONS: NOV /DEC 2024

(Regulation 2024)

First Semester

COMMON TO AERO / AUTO / MECH

24PHI106: Engineering Physics

COURSE OUTCOMES

- CO1:** Apply the principles of elasticity to solve problems related to stress, strain, and bending of beams.
- CO2:** Analyse the fundamentals of quantum mechanics to interpret the behaviour of particles at the atomic and subatomic levels.
- CO3:** Evaluate the principles of laser operation to assess their applications in various fields such as imaging and holography.
- CO4:** Examine the methods of non-destructive testing to categorize and select appropriate surface coating techniques.
- CO5:** Assess various green energy technologies to recommend efficient solutions for sustainable energy use.
- CO6:** Apply scientific methods and experiment techniques to enhance understanding of fundamental concepts and their application in various technological fields.

Time: Three Hours

Maximum Marks: 100

PART A (4 * 20 = 80 Marks)

Answer all the Questions

- | | | | | | |
|----|----|---|----|-----|-------------------|
| 1. | a) | Infer the significance of Young's modulus in beam design. | 2 | CO1 | [K ₁] |
| | b) | Scenario: A beam of rectangular cross-section is subjected to bending under a load of 400 N. Derive the expression for the bending moment and calculate the depression if the beam has dimensions $b = 30$ mm, $h = 20$ mm, and $L = 1.5$ m. Use $E = 2.1 \times 10^{11}$ N/m ² . | 12 | CO1 | [K ₂] |
| | c) | Explain the factors affecting the stress-strain behavior of materials. | 4 | CO1 | [K ₃] |

	d)	How is the principle of non-uniform bending applied to determine the Young's modulus of a beam?	2	CO6	[K ₁]
2.	a)	Justify the necessity of quantum mechanics over classical mechanics.	2	CO2	[K ₁]
	b)	Derive the expression for the eigen values of a particle in a one-dimensional box.	8	CO2	[K ₂]
	c)	Discuss the concept of wave function normalization and its significance.	4	CO2	[K ₃]
	d)	Compare time-dependent and time-independent Schrödinger equations.	4	CO2	[K ₂]
	e)	How quantum tunneling is utilized in modern electronic devices?	2	CO6	[K ₂]
3.	a)	Why population inversion is critical for laser operation?	2	CO3	[K ₁]
	b)	Explain the principle and working of liquid penetrant testing.	4	CO4	[K ₂]
	c)	Discuss the differences between A-scan and B-scan ultrasonic flaw detection methods.	4	CO4	[K ₃]
	d)	Describe the working of a CO ₂ laser and its applications in the aerospace industry.	8	CO3	[K ₂]
	e)	How does spin coating improve the uniformity of thin films?	2	CO6	[K ₂]
4.	a)	List out the advantages of ocean energy as a renewable energy source.	2	CO5	[K ₁]
	b)	What is the significance of second-generation solar cells?	2	CO5	[K ₂]
	c)	Discuss the principle and working of wind turbines for power generation from wind energy.	12	CO5	[K ₃]
	d)	List out the opportunities associated with methane hydrates as a renewable energy source.	2	CO5	[K ₃]
	e)	What are the advantages of using I-shaped girders in construction?	2	CO6	[K ₂]

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

5.	a)	Write the principle for determining Young's modulus using uniform bending.	2	CO6	[K ₁]
	b)	What are the industrial applications of laser gyroscope?	2	CO3	[K ₂]
	c)	Compare the efficiency and working of Nd:YAG and CO ₂ lasers in industrial applications.	6	CO3	[K ₃]

- d) Discuss the process of thin-film deposition using Physical Vapor Deposition (PVD) and its role in the aerospace industry. 10 CO4 [K₃]

OR

6. a) What is Superposition principle? 2 CO6 [K₁]
 b) Recollect the advantages of hydrogen energy over conventional energy systems. 2 CO6 [K₂]
 c) Explain the role of laser holography in industrial quality control. Provide example. 8 CO3 [K₃]
 d) Describe the energy conversion principle in solar cells and derive the expression for efficiency. 8 CO4 [K₃]

CO distribution summary:

	CO1	CO2	CO3	CO4	CO5	CO6
Marks (%)	20	20	12	8	20	20
