



B.E/B.TECH DEGREE EXAMINATIONS: APRIL/ MAY 2024

(Regulation 2018)

Second Semester

COMMON TO AUTO/CIVIL/ECE/ISE/IT/MCE/MECH)

U18PHI2202: Engineering Physics

COURSE OUTCOMES

- CO1:** Enhance the fundamental knowledge in properties of matter and its applications relevant to various streams of Engineering and Technology.
- CO2:** Understanding the phenomenon of heat and transfer mechanism in engineering systems.
- CO3:** Acquire essential knowledge in the concepts of quantum mechanics and its impact on electron microscopy.
- CO4:** Analyze the concept of lasers, optical fibers, and their importance in diverse fields of engineering.
- CO5:** Apply the principles of acoustic and ultrasonic techniques for engineering practice.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

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|-----|---|-----|-------------------|
| 1. | State Hooke's Law. | CO1 | [K ₂] |
| 2. | Rewrite the factors affecting elastic modulus of a beam. | CO1 | [K ₂] |
| 3. | Define thermal conductivity. | CO2 | [K ₁] |
| 4. | Infer the Planck's concept hypothesis of a matter waves. | CO3 | [K ₂] |
| 5. | Write the significance of the Schrödinger's wave equation. | CO3 | [K ₂] |
| 6. | Population inversion must be achieved to attain lasing action. Justify with your answer. | CO4 | [K ₂] |
| 7. | Write the conditions to be satisfied to archive total internal reflection in optical fibers | CO4 | [K ₂] |
| 8. | Define reverberation time. | CO5 | [K ₂] |
| 9. | Write a short note in thermal detection of ultrasonic waves. | CO5 | [K ₂] |
| 10. | Rewrite the significance of acoustic grating. | CO5 | [K ₂] |

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11. Scenario: An engineer is tasked with designing a bridge that can withstand specific stress and strain conditions. The bridge materials must be evaluated for their elastic modulus and the expected depression under load.
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|---|---|-----|-------------------|
| a) Calculate the Young's modulus for a given material using the stress-strain diagram. | 7 | CO1 | [K ₃] |
| b) Determine the depression of a cantilever beam under a specified load. | 7 | CO1 | [K ₂] |
| c) Explain the importance of choosing the right materials for the construction of the bridge. | 2 | CO1 | [K ₂] |
12. **Scenario:** A thermal engineer needs to design a heat exchanger system for an industrial application. The system must ensure efficient heat transfer and minimal energy loss.
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| a) Calculate the thermal conductivity of a given material using Lee's disc method. | 7 | CO2 | [K ₃] |
| b) Explain the importance of thermal insulation materials. | 7 | CO2 | [K ₂] |
| c) Rewrite the applications of heat exchangers in industry. | 2 | CO2 | [K ₂] |
13. a) Derive the expression for Compton shift of a recoiling electron after collision with a specific target
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|--|---|-----|-------------------|
| | 7 | CO3 | [K ₂] |
|--|---|-----|-------------------|
- b) Arrive expressions of De-Broglie wavelength in different forms and write their significance.
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| | 7 | CO3 | [K ₂] |
|--|---|-----|-------------------|
- c) What are the applications of the Compton effect in modern technology?
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|--|---|-----|-------------------|
| | 2 | CO3 | [K ₂] |
|--|---|-----|-------------------|
14. a) Discuss the working principle of Nd-YAG laser with neat diagram.
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|--|---|-----|-------------------|
| | 7 | CO4 | [K ₂] |
|--|---|-----|-------------------|
- b) Explain the structure of optical fiber and the principle of light propagation in optical fibers.
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|--|---|-----|-------------------|
| | 7 | CO4 | [K ₂] |
|--|---|-----|-------------------|
- c) List the application of optical fibers in industry.
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|--|---|-----|-------------------|
| | 2 | CO4 | [K ₂] |
|--|---|-----|-------------------|
15. a) Explain the factors affecting the acoustics of a building.
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|--|---|-----|-------------------|
| | 7 | CO5 | [K ₂] |
|--|---|-----|-------------------|
- b) Describe magnetostriction method used for the production of ultrasonic waves.
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|--|---|-----|-------------------|
| | 7 | CO5 | [K ₃] |
|--|---|-----|-------------------|
- c) Discuss the applications of ultrasonic waves in medical diagnostics.
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|--|---|-----|-------------------|
| | 2 | CO5 | [K ₂] |
|--|---|-----|-------------------|
16. a) Derive wave equation for a particle in one dimensional box.
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| | 8 | CO3 | [K ₂] |
|--|---|-----|-------------------|
- b) Compare and contrast Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM).
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|--|---|-----|-------------------|
| | 8 | CO3 | [K ₃] |
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