

**A 454**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2005.

First Semester

PH 125/PH 131 — PHYSICS — I

(Common to All Branches Except Marine Engineering)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Calculate the geometric moment of inertia of a bar of breadth 25 mm and thickness 4 mm.
2. What are the advantages of Pirani gauge?
3. In what units intensity of sound is measured?
4. Explain any one application of ultrasonics in medicine.
5. Steam is allowed to pass through a rubber pipe. Assuming that heat is conducted radially outward from the axis of the pipe, explain the meaning of steady state.
6. What information one can get from temperature–entropy diagram?
7. A paper of  $50\mu$  thick is used to form interference fringes in an air wedge with a source of light of wavelength 589.3 nm. Calculate the bandwidth of fringes formed, if the length of air wedge is 7 cm.
8. Mention any two applications of metallurgical microscope.
9. Mention any two applications of semiconductor lasers.
10. What are the types of optical fibres in use?

PART B — (5 × 16 = 80 marks)

11. (i) Derive an expression for couple per unit twist of a wire. (10)  
(ii) Calculate the couple to be applied to twist a wire of length 80 cm fixed at one end and free at the other through  $1^\circ$ . (Radius of wire = 0.03 cm and rigidity modulus of material of wire =  $200 \times 10^9$  Pa). (6)
12. (a) Derive an expression for the rate of growth of intensity of sound in an auditorium when a sound source is switched on. Obtain an expression for the rate of decay of sound when it is switched off. Hence arrive at a formula for the reverberation time of the auditorium. (16)

Or

- (b) (i) What is piezo electric effect? Explain, with a neat circuit diagram, the working of a piezo electric oscillator to produce ultrasonic waves. (2+8)
- (ii) Calculate the thickness of a quartz crystal to produce ultrasonic waves of frequency  $20 \times 10^6$  Hz (Density and Young's modulus of quartz are  $2650 \text{ kgm}^{-3}$  and  $80 \times 10^9$  Pa respectively). (6)
13. (a) Describe, with necessary theory, *Lees' disc* experiment of estimating the thermal conductivity of a poor conductor. (16)

Or

- (b) Describe with a neat diagram, the working of an Otto engine and derive an expression for its efficiency. (16)
14. (a) (i) With a neat diagram, explain the working of a *Lummer-Brodhun* photometer. How do you compare the luminous intensities of two sources of light using it. (10)
- (ii) In a hall a bulb is lighted at a height of 5 m from the floor. Calculate the ratio of illumination at a point vertically below it and at a point 12 m from it. (6)

Or

- (b) (i) With a neat diagram, explain the construction of *Michelson's* interferometer. Explain the conditions for the formation of different types of fringes in it. (10)
- (ii) How is *Sextant* used to measure the height of a tall building at a distance from an observer? Derive the formula used. (6)
15. (a) Describe with a neat diagram, the construction and working of *He-Ne* laser. Explain the production of laser beam in *He-Ne* laser with the help of energy level diagram. (8+8)

Or

- (b) (i) What is meant by *mode* in an optical fibre? Arrive at an expression for numerical aperture of an optical fibre. (2+6)
- (ii) What are the essential parts of an optical fibre sensor system? Explain, in detail, the working of any one optical fibre sensor. (2+6)