

2015

(2nd Semester)

PHYSICS

SECOND PAPER

(Oscillations, Acoustics and Optics)

Full Marks : 55

Time : 2½ hours

(PART : B—DESCRIPTIVE)

(Marks : 35)

*The figures in the margin indicate full marks
for the questions*

1. (a) Show that the total energy of a particle
in simple harmonic motion is conserved. 3
- (b) Derive an expression for the time period
of oscillation of a bar pendulum. 4

Or

2. What do you mean by standing waves? How
are nodes and antinodes formed? Find an
expression for normal modes of a stationary
body.

1+3+3=7

2. Write the differential equation for damped vibration. Hence obtain the solution. 7

Or

- (a) What do you mean by reverberation? On what factors does it depend? 1+2=3
- (b) Describe a method of producing ultrasonic waves. 4
3. (a) Using the concepts of cardinal points in thick lens, answer the following questions :
- (i) How many refractions take place for a single-light ray when passing through the lens?
- (ii) In which plane does refraction take place?
- (iii) What is the advantage of the concepts of cardinal points over the idea of considering refractions at each surface of the lens? 1+1+1=3
- (b) Show that in thick lens nodal points and principal points coincide if the refractive indices are same on either sides of the lens. 4

Or

What are aplanatic points and aplanatic surface? Discuss the principle of Abbe's homogeneous oil-immersion microscopic objectives. $2+5=7$

4. Discuss the theory of Newton's rings. On what phenomenon does it depend? How can the wavelength of light be determined with the help of Newton's rings method? $2+1+4=7$

Or

State and explain Brewster's law for polarization of light. What is meant by optical rotation? Explain polarization of light by refraction. $3+1+3=7$

5. What is a zone plate? Give the theory of zone plate. Show that a zone plate has multiple foci. $1+3+3=7$

Or

- (a) Explain diffraction at N slits. 2
- (b) Give the theory of plane transmission grating and show how you would use it to determine the wavelength of light.

$2+3=5$

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PHYSICS

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(PART : A—OBJECTIVE)

(Marks : 20)

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SECTION—I

(Marks : 5)

Tick (✓) the correct answer in the brackets provided : $1 \times 5 = 5$

1. In CRO the deflection of electrons by two mutually perpendicular electric fields with the same amplitude and having 90° phase difference results in electron path which is a/an

(a) circle ()

(b) straight line ()

(c) ellipse ()

(d) parabola ()

2. In forced vibration, the quantity which measures the sharpness of resonance is the

(a) amplitude ()

(b) quality of factor ()

(c) energy ()

(d) power of the vibrating system ()

3. For achromatism, the lenses should be

(a) concave and convex and of same material ()

(b) concave and convex and of different materials ()

(c) both convex and of same material ()

(d) both convex and of different materials ()

4. Light waves exhibit polarization because they are

(a) longitudinal waves ()

(b) transverse waves ()

(c) stationary waves ()

(d) non-mechanical waves ()

5. The resolving power of diffraction grating decreases by

(a) increasing the total number of lines ()

(b) decreasing the total number of lines ()

(c) increasing the grating element ()

(d) decreasing the grating element ()

(4)

SECTION--II

(Marks : 15)

Write very short answers to the following questions : 3×5=15

1. Write in brief on Chladni figures.

2. Calculate the change in loudness when intensity of sound increases 100 times its original intensity.

3. Mention three (3) points of distinction between Huygens' eyepiece and Ramsden eyepiece.

4. What do you mean by double refraction?

8. Explain the difference between Fresnel and Fraunhofer class of diffraction

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