

(6 pages)

Reg. No. :

Code No. : 20295 E Sub. Code : CMPH 21

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2025.

Second Semester

Physics – Core

OPTICS AND ACOUSTICS

(For those who joined in July 2021 and 2022 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. In an aplanatic lens _____ is minimum
- (a) Coma
 - (b) Astigmatism
 - (c) Spherical aberration
 - (d) None

2. In a Huygen's eye piece _____ minimum

- (a) spherical aberration only
- (b) chromatic aberration only
- (c) both spherical and chromatic aberrations
- (d) none

3. In an air-wedge, fringe width (β) is _____

- (a) constant
- (b) increasing from left
- (c) increasing from right
- (d) none

4. In a Michelson interferometer, if x is the distance moved and N is the number of fringes moved, then the wave length λ is _____

- (a) $\lambda = \frac{N}{2x}$
- (b) $\lambda = \frac{2N}{x}$
- (c) $\lambda = \frac{x^2}{N}$
- (d) $\lambda = \frac{2x}{N}$

5. In a Fraunhofer diffraction, the incident waves are _____ waves
- (a) Plane (b) Spherical
(c) Elliptical (d) None
6. A half wave plate produces a path difference of
- (a) $\frac{\lambda}{4}$ (b) $\frac{\lambda}{2}$
(c) $\frac{\lambda}{8}$ (d) $\frac{\pi}{2}$
7. The distance between two successive anti-modes is _____
- (a) λ (b) $\frac{\lambda}{4}$
(c) $\frac{\lambda}{2}$ (d) 0
8. In simple harmonic motion the acceleration is _____ proportional to the displacement from central position
- (a) directly (b) inversely
(c) constant (d) none

9. Ultrasonic waves have _____ energy
- (a) Low (b) High
(c) Zero (d) Negative
10. Ultrasonic waves produce _____ effect when passed through a substance
- (a) cooling (b) heating
(c) magnetic (d) electric

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Define dispersion. Explain dispersion light by a prism.
- Or
- (b) Explain the working of constant deviation spectrometer.
12. (a) Explain the testing of planeness of surface.
- Or
- (b) What are the applications of Michelson interferometer?

13. (a) Distinguish between Fresnel and Fraunhofer diffractions.

Or

- (b) Explain the working of a Half-wave plate.

14. (a) Explain the working of a Helmholtz resonator.

Or

- (b) State and explain the laws of transverse vibrations of strings.

15. (a) What are ultrasonic waves? Give any two properties.

Or

- (b) Give any five factors which are affecting the acoustics of buildings.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain any two aberration in lenses. How they are removed?

Or

- (b) Explain deviation, without dispersion. How can it be achieved using small angled prisms?

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17. (a) Explain the experimental determination of thickness of thin wire using air-wedge.

Or

- (b) Explain interference in thin films due to reflected light.

18. (a) Describe the theory of Fresnel diffraction due to a circular aperture.

Or

- (b) Give the construction and theory of (i) Quarter wave plate and (ii) Half wave plate.

19. (a) Explain the determination of a.c. frequency using sonometer.

Or

- (b) Explain Melde's string method of determining the frequency of a tuning fork by longitudinal mode.

20. (a) Explain the production of ultrasonic waves by piezo - electric method.

Or

- (b) Derive Sabine's formula for the reverberation time.

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