

June : 2026

PHYSICS

Paper: PHY-C-201

Waves & Optics

Time: 2½ Hours

Total Mark: 60

(The figures in the right margin indicate full marks of the questions)

1. Choose the correct answer:

1×5=5

a) In a non-dispersive medium, which of the following is true?

i) $v_p > v_g$

ii) $v_p < v_g$

iii) $v_p = v_g$

iv) $v_p = 0$

b) Which of the following is true regarding secondary wavelets in Huygens' construction?

i) They propagate with a higher velocity than the original wave.

ii) They propagate with a lower velocity than the original wave.

iii) They propagate with the same velocity as the original wave.

iv) They only move in the forward direction.

c) If the entire Young's double slit experiment apparatus is immersed in a liquid of refractive index $\mu > 1$, what happens to the fringe width?

i) Increases.

ii) Decreases.

iii) Remains the same.

iv) Fringes disappear.

d) Which of the following waves cannot be polarized?

- i) Radio waves ii) Light waves
- iii) Sound waves iv) X-rays

e) If the distance between the virtual slits (d) in a Fresnel's biprism experiment is increased, the fringe width (β) will:

- i) Increase ii) Decrease
- iii) Remain unchanged iv) Become infinite

2. Answer briefly (*any five*): 2×5=10

- a) Mention two characteristics of standing waves.
- b) What are harmonics. Explain in brief.
- c) Give two properties of a wavefront.
- d) How does the Fermat's principle explain the law of refraction?
- e) What are Fizeau fringes?
- f) What are the factors which affect the velocity of sounding air?

3. Answer the following questions: 5×7=35

- a) Discuss the phenomena of Fraunhofer diffraction at a single slit and Derive expression for intensity. 3+2=5

Or

Describe the construction and working of a Michelson Interferometer. 5

- b) What is a zone plate? Explain its theory and compare its working to that of a convex lens. 1+2+2=5

c) What are Lissajous' figures? Discuss when two simple harmonic motions perpendicular to each other and act simultaneously on a particle in phase 0° and $\frac{\pi}{4}$. 1+3=4

d) Write the Newton's formula for velocity of longitudinal waves in air. Explain why and how Laplace corrected the formula. 1+4=5

e) State and prove Brewster's Law. Show that when light is incident at the polarizing angle, the reflected and refracted rays are perpendicular to each other. 1+1+3=5

f) Find an expression for velocity of transverse vibration of stretched strings. 5

g) Discuss Fresnel's half period zone for plane wave. 4

4. Write short notes on (*any three*): 4×3=12

- a) Nicol prism 4
- b) Beats 4
- c) Newton's rings 4
- d) Fraunhofer diffraction 4
