

**2024**

**(Session : 2022-26)**

*Time : 3 hours*

*Full Marks : 75*

*Candidates are required to give their answers in their own words as far as practicable.*

*The figures in the margin indicate full marks.*

*Answer from both the Groups as directed.*

*All symbols used have their usual meanings.*

**Group – A**

**(Very Short-answer Type Questions)**

**(Compulsory)**

1. Answer the following questions :  $1 \times 5 = 5$

- (a) If  $\phi_0$  is the initial phase, then equation of a plane progressive harmonic wave moving along positive direction of X-axis is mathematically expressed as  $y = \underline{\hspace{2cm}}$

(b) For two sources of light to be coherent, it is essential that they must be derived from the same source and must be monochromatic.  
(True / False)

(c) Write the name of the factors on which the square of the radius of any dark fringe in Newton's rings depend.

(d) A well known optical device that is based on the concepts of Fresnel's half-period zones is known as \_\_\_\_\_.

(e) What is a Nicol prism ?

**(Short-answer Type Questions)**

2. Explain the differences between Fresnel's and Fraunhofer's diffraction of light. 5

3. Explain why a quarter-wave ( $\lambda/4$ ) plate and a half-wave ( $\lambda/2$ ) plate are known as retardation plates. 5

**Group – B**

**(Descriptive Type Questions)**

Answer any four questions of the following :

15×4 = 60

4. Derive Newton's formula of speed of sound in air and discuss Laplace's correction.

5. What are Newton's rings ? Explain with theory and ray diagram, how you would produce Newton's rings ? Use them for measuring wavelength of a monochromatic light.

6. With schematic diagram, discuss about essential parts of Michelson interferometer. Under what conditions are circular fringes formed in this interferometer ?

7. Describe a plane diffraction grating and give its theory considering it as a combination of N-slits. How can it be used to measure the wavelength of sodium light ?

8. What is Zone plate ? How is it constructed ? Give its theory and show that a zone plate has multiple foci.

9. Describe the construction and theory of a Babinet's compensator with suitable schematic diagram. Describe how it is used for the analysis of elliptically polarized light.



KW – 35/3 (600)

(3) FYU-ESUE(III) — Phy  
(MJ – 4)

KW – 35/3

(2)

Contd.