

Sl. No. of Ques. Paper : 1467

F-7

Unique Paper Code : 2221303

Name of Paper : Waves and Optics

Name of Course : B.Sc. (Hons.) Physics (Erstwhile FYUP)

Semester : III

Duration : 3 hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt five questions in all including Question No. 1 which is compulsory.

All questions carry equal marks.

1. Attempt any five of the following : 5x3=15
- (a) What are beats? Give necessary conditions for obtaining beats.
 - (b) Obtain a relation between group velocity and phase velocity in a dispersive medium.
 - (c) State and explain Huygens principle of secondary waves.
 - (d) State the essential conditions for obtaining a sustained interference pattern.
 - (e) When the movable mirror of Michelson's interferometer is shifted through 0.059 mm, a shift of 200 fringes is observed. Determine the wavelength of light used in Angstrom units.
 - (f) Distinguish between Fraunhofer and Fresnel diffraction.
 - (g) Calculate the minimum number of lines in a grating which will resolve the doublet of two sodium lines of wavelengths 5890 Å and 5896Å, in the first order.
2. (a) Explain the formation of standing waves on a stretched string by giving necessary theory. 10
- (b) Construct the Lissajous figure for the following if $\gamma = \pi/2$:
 $x = 2 \cos(2\omega t + \gamma)$ and $y = 2 \cos(\omega t)$. 5
3. (a) Describe briefly the Fresnel biprism experiment for producing interference fringes in a distant plane. 10
- (b) In a Newton's rings experiment the diameter of the 12th ring changes from 1.50 cm to 1.35 cm when a liquid is introduced between the lens and the plate. Calculate the refractive index of the liquid. 5
4. (a) Describe briefly the construction and working of Michelson's interferometer. How it can be used to measure the refractive index of a thin transparent sheet. 12
- (b) Why interference fringes obtained in Fabry-Perot interferometer are

- sharper than that of Michelson's interferometer? 3
5. (a) Discuss Fraunhofer diffraction due to double slit. Draw and discuss the curve indicating distribution of intensity in the diffraction pattern. 12
(b) Calculate the aperture of the objective of a telescope which may be used to resolve stars separated by 4.88×10^{-6} radian for light of wavelength 6000 Å. 3
6. (a) Derive Fresnel's integrals. 10
(b) Discuss Fresnel diffraction pattern due to a narrow wire. 5
7. Write short notes on any *three* of the following:
(a) Linearity and Superposition Principle
(b) Haidinger and Fizeau fringes
(c) Cornu's Spiral
(d) Kirchoff's Integral Theorem (5×3=15)