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[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5778

E

Unique Paper Code : 42224412

Name of the Paper : Waves and Optics

Name of the Course : B.Sc. (Prog.) Physical
Science

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. **Question no. 1** is compulsory.
3. Attempt **any five** questions in all.
4. **All** questions carry equal marks.

1. (a) State the principle of superposition in the context of two collinear harmonic oscillations of same frequency.

P.T.O.

- (b) What are beats? Write an expression for the frequency of beats.
- (c) Compare the intensity pattern obtained by Young's double slit interference experiment and Fraunhofer diffraction due to a double slit.
- (d) Write two differences between travelling and stationary waves.
- (e) Distinguish between Fizeau and Haidinger Fringes? Give examples.
- (f) Distinguish between Fraunhofer and Fresnel's class of diffraction.
- (g) Calculate the change in intensity level when the intensity of sound increases 100 times its original intensity.
2. (a) What do you understand by Lissajous figures? (3)
- (b) Find the resultant of two perpendicular simple harmonic motions whose amplitudes are in the ratio 1:2 and the phase difference is 90° . (12)

- 3 (a) What are normal modes of vibration in a stretched string? Discuss the possible modes of vibration of a stretched string of finite length fixed at both ends. (8)
- (b) What do you mean by wave velocity and group velocity? Derive the relation between them in a dispersive medium. (7)
4. (a) Explain how sound waves are produced. What do you understand by intensity and loudness of sound? (7)
- (b) How does a noise is different from musical notes? Discuss in detail how musical scales are made? (8)
5. (a) Explain the phenomenon of interference of light due to thin films and find the condition for maxima and minima. (10)
- (b) An oil film ($\mu=1.47$) of thickness $t=0.12 \mu\text{m}$ rests on a pool of water. If light strikes the film at an angle of 60° , what is the wavelength reflected in the first order? (5)

6. (a) Describe the construction and working of Michelson's interferometer. Explain how it is used to determine wavelength of monochromatic light. (10)
- (b) When the movable mirror of Michelson interferometer is moved through 0.06854 mm, a shift of 220 fringes is observed. Find the wavelength of light used. (5)
7. (a) Explain with theory, Fresnel type of diffraction due to straight edge. (7)
- (b) Explain the theory of plane transmission grating. How it can be used to find the wavelength of light? (8)
8. (a) What do you mean by plane polarised light? What are the various ways to produce it? (7)
- (b) Describe how one can produce and detect circularly-polarised and elliptically-polarised light with the help of Nicol prism and quarter-wave plate. (8)

(3000)