

Roll No.

Exam Code : J-21

Subject Code—53404

B. Sc. EXAMINATION

(Batch 2018 Onwards)

(Main & Re-appear)

(Fourth Semester)

PHYSICS

CPL-403

Wave and Optics (Core Course–VIII)

Time : 3 Hours

Maximum Marks : 80

Note : Attempt *Five* questions in all. Q. No. 1 is compulsory. All questions carry equal marks.

(Compulsory Question)

1. (a) What are Transverse Waves ? 2
- (b) Define the following : 2
 - (i) Phase Velocity
 - (ii) Group Velocity.

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- (c) Why do we prefer a point source of light in Young's double slit experiment ? 2
- (d) If distance between two coherent sources is decreased, then how interference pattern changes ? Explain. 2
- (e) Define the following : 2
- (i) Interference
 - (ii) Diffraction.
- (f) What do you mean by limit of resolution ? 2
- (g) Light waves can be polarized whereas sound waves cannot be polarized. Why ? 2
- (h) What is a multi-mode optical fibre ? 2

Section A

2. (a) What are Longitudinal Waves ? Derive an expression for the speed of longitudinal waves in a fluid in a pipe. 10
- (b) What are the main differences between progressive and standing waves. 6

3. (a) Derive an expression for the total energy of travelling wave. 10
- (b) A 45 cm long wire having mass 64 gram is stretched such that it makes 75 vibrations per second. Find the stretching force ? 6

Section B

4. (a) What are Coherent Sources ? Discuss their importance in interference. Give a method for their production. 10
- (b) A thin sheet of a glass 453 nm thick is placed in the path of one of the interfering beams in biprism arrangement. If the central maximum shifted to the position earlier occupied by 7th bright fringe, calculate the refractive index of the sheet. Given wavelength of light used is 600 nm. 6
5. (a) Describe Fresnel's biprism method of finding the wavelength of light. Give theory of the method. 8
- (b) Discuss interference in thin films due to transmitted light. 8

Section C

6. (a) What is a Zone Plate ? Derive an expression for its focal length. Show that a zone plate has multiple foci. 8
- (b) Discuss Fraunhofer diffraction at a single slit. Find width of central maxima. 8
7. (a) Distinguish between Fresnel and Fraunhofer class of diffraction. Derive an expression for the Fresnel diffraction due to straight edge. 10
- (b) Define resolving power. Obtain an expression for resolving power of telescope. 6

Section D

8. (a) Explain the methods of production and detection of plane, elliptically and circularly polarized light. 12
- (b) State and explain Law of Malus. 4

9. (a) Define Optical Fibre. Explain its construction and working. 6
- (b) What do you mean by Attenuation ? Explain different types of attenuation losses in an optical fibre. 6
- (c) In an optical fibre, the core material has refractive index 1.52 and refractive index of clad material is 1.40. Find the critical angle and numerical aperture of the optical fibre. 4