321202

May 2023
B.Sc. (Physics) II SEMESTER
Waves & Optics (BPH-202A)

Time : 3 Hours]   [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*

2. *Answer any four questions from Part-B in detail.*

3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART-A

1. (a) What are the fringes of equal inclination?   (1.5)

    (b) In case of interference in wedge-shaped film, the edge is dark, why?   (1.5)

    (c) Why the central ring is not a zero order fringe?   (1.5)

    (d) Which class of diffraction phenomenon is used for all practical purposes?   (1.5)

    (e) Why a zone plate has multiple foci?   (1.5)

    (f) State Brewster's law.   (1.5)

(g) What is grating and what are the types of grating? (1.5).

(h) Write difference between longitudinal and transverse waves. (1.5)

(i) What are ordinary and extra-ordinary rays? (1.5)

(j) What is the role of compensatory plate in Michelson Interferometer? (1.5)

PART-B

2. (a) Discuss the interference produced in wedge-shaped film and find the conditions of maxima and minima. Also find expression for fringe width. (10)

   (b) Show that a phase change of π occurs when reflection takes place at the surface of a denser medium. (5)

3. (a) What is the relation between phase difference and path difference and explain the analytical treatment of interference? (7)

   (b) Define the phase velocity and group velocity. Explain and derive the relation between phase velocity and group velocity. (8)

4. Discuss the formation of Newton's rings by (i) reflected light (ii) transmitted light. Derive an expression for radius of nth dark ring in reflected light. (15)

5. (a) What are coherent sources? Give the conditions to produce good interference. (5)

   (b) What is a zone plate and how it is constructed? Derive an expression for its focal length and compare its performance with that of a converging lens. (10)

6. (a) What is the phenomenon of double refraction? Which of the two rays, the ordinary or the extra-ordinary, travel faster along a direction other than the optic axis in a positive crystal? Describe the construction and action of a Nicol prism. (10)

   (b) State and explain the law of Malus. (5)

7. (a) Distinguish between Fresnel and Fraunhoffer type of diffraction. (5)

   (b) Discuss Fraunhoffer diffraction at double slit. Find the position of maxima and minima. (10)

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