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December, 2019
B.Sc. (H) Chemistry Semester-III
Wave & Optics (OPHY-301)

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.*

4. *Assume suitable standard data wherever required, if not given.*

PART - A

1. (a) Differentiate transverse and longitudinal waves. (1.5)

   (b) What are beats? Give necessary condition for obtaining beats. (1.5)

   (c) Obtain a relationship between group velocity and phase velocity in a dispersive medium. (1.5)

(d) State and explain Huygens principle of secondary waves. (1.5)

(e) How many orders will be visible if the wavelength of the incident radiation is 500 nm and the number of lines on the grating is 12000 per inch? (1.5)

(f) What purpose is achieved by introducing a compensating glass plate in Michelson interferometer? (1.5)

(g) Differentiate Fresnel's diffraction and Fraunhoffer diffraction. (1.5)

(h) Why does a thin film appear coloured when seen from white light? (1.5)

(i) Why the central point in the Lloyd's mirror method is a dark point? (1.5)

(j) Define plane of polarization, plane of vibration of light and Brewster's angle. (1.5)

PART - B

2. (a) What is superposition Principle in SHM? Discuss the superposition of two collinear oscillations having equal frequencies but different amplitudes. (10)

(b) What are Lissajous figures? What are the uses of Lissajous figures? Obtain Lissajous figures for two SHMs with phase difference of (i) zero and (ii) $\pi/2$. (5)

3. (a) Explain the formation of standing waves on a stretched string, giving the necessary theory. (10)

(b) What are plane and spherical waves? Explain with suitable examples. (5)

4. (a) Find an expression for fringe width in case of Young's double slit experiment and show that bright and dark fringes are of equal width. (10)

(b) Give the differences between Lloyd's mirror and biprism fringes. (5)

5. Describe the plane transmission grating. Discuss analytically the diffraction at N slits. (15)

6. (a) Explain with the help of the experimental arrangement, the theory of the formation of Newton's rings by reflected light. Why they are circular in shape? (10)

(b) Newton's rings are observed normally in reflected light of wavelength 6000 Å. The diameter of 10th dark ring is 0.50 cm. find the radius of curvature of the lens and the thickness of the film. (5)

7. (a) What is meant by half period elements? How is rectilinear propagation of light explained on the basis of wave theory? (10)

(b) What is a zone plate? Compare it with a convex lens. (5)

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