

B.Sc. S.Y. (CBCS Pattern) Sem-IV
USPHT-08 : Physics Paper-II : Optical Physics

P. Pages : 2

Time : Three Hours



GUG/W/22/12017

Max. Marks : 50

- Notes : 1. All questions are compulsory.
2. Draw neat labelled diagram wherever necessary

Either :

1. A) i) What are the constructive interference and destructive interference of light? 2
ii) Explain the phenomenon of interference in thin film. Obtain the condition for maxima and minima for interference in thin film, due to reflected rays of light. 6
iii) The light of wavelength 5893 \AA falls on a thin glass plate ($\mu = 1.5$) such that the angle of refraction in plate is 60° . Find the minimum thickness of the plate such that the plate appears dark in the reflected light. 2

OR

- B) a) Explain the interference at wedge shaped film due to reflected light. 2 ½
b) Describe an experiment to determine the wavelength of monochromatic light with Biprism. 2 ½
c) Explain the classification of interference of light by 2 ½
i) Division of wavefront and ii) Division of amplitude.
d) A wedge shaped air film, having an angle of 40 seconds is illuminated by a monochromatic light and fringes are observed vertically through a microscope. The distance measured between two consecutive bright fringes is $0.12 \times 10^{-2} \text{ m}$. Calculate the wavelength of light used. 2 ½

Either :

2. A) i) What are Newton's rings? 1
ii) Explain the experimental arrangement to obtain Newton's rings. Obtain an expressions for the diameters of bright and dark rings in reflected light. 7
iii) In Newton's ring experiment, the radius of curvature of convex lens is 5m and its diameter is 20 mm. How many rings can be seen with the light of wavelength 5000 \AA ? 2

OR

- B) a) Draw the experimental arrangement of Michelson's interferometer and explain construction. 2 ½
b) How will you determine the difference in two nearly equal wavelengths with Michelson's Interferometer. 2 ½
c) Explain the method of determination of Wavelength of monochromatic light with Michelson's Interferometer. 2 ½
d) When movable mirror of Michelson's interferometer is shifted through 0.02897 mm , a shift of 100 fringes is observed. Find the wavelength of light used. 2 ½

Either :

3. A) i) What is diffraction? 1
ii) Explain the difference between interference and diffraction. 2

- iii) Explain the theory of Fresnel's diffraction at a straight edge. Obtain an expression for the intensity at various points on the screen 5
- iv) Calculate the radii of first two Zenes in a Zone plate behaving like a convex lens of focal length 20 cm for a light of wavelength 5000 A°. 2

OR

- B) a) Distinguish between Fresnel and Fraunhofer diffraction. 2 ½
- b) Describe the Fraunhofer diffraction due to a single slit. 2 ½
- c) Describe in detail how plane transmission grating is used to determine the wavelength of a monochromatic light. 2 ½
- d) A grating with 2500 lines per cm is illuminated at the normal incidence by light of wavelength 6000 A°. How many orders will be visible? 2 ½

Either :

- 4. A) i) What is polarization of light? 1
- ii) Define the term plane of polarization and plane of vibration. 2
- iii) Describe the construction and working of Nicol prism to obtain the polarized light. 5
- iv) If the refractive indices for ordinary and extraordinary rays are 1.54 and 1.45 respectively. Calculate the minimum thickness of half wave plate for wavelength 5500 A°. 2

OR

- B) a) State and Prove Brewster's law. 2 ½
- b) Explain the use of Nicol prism as an analyzer of plane polarized light. 2 ½
- c) What is quarter wave plate? Obtain an expression for thickness of a quarter wave plate. 2 ½
- d) The refractive index of diamond for sodium light is 2.417. Find the angle of incidence for which the light reflected from diamond is completely plane polarized. 2 ½

5. Solve **any ten** of the followings.

- a) What are coherent sources? 1
- b) State the Huygen's principle of propagation of wave front. 1
- c) State the condition for obtaining steady interference pattern. 1
- d) Why the centre of Newton's ring appear dark in reflected light? 1
- e) What is an interferometer? 1
- f) Why we use compensating glass plate in Michelson's interferometer? 1
- g) Define grating element. 1
- h) Define plane diffracting grating 1
- i) What is zone plate? 1
- j) Define uniaxial crystal. Give its example. 1
- k) What is double refraction? 1
- l) Define biaxial crystal with example. 1
