

B.Sc. S.Y. (CBCS Pattern) Semester-IV
USPHT08 - Physics Paper-II - Optical Physics

P. Pages : 3

Time : Three Hours



GUG/S/25/12017(S)

Max. Marks : 50

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- Notes :
1. All questions are compulsory.
 2. Draw neat labelled diagram wherever necessary.
 3. Scientific calculator is allowed.

Either:

1. A) i) 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. 5
- ii) Define interference of light. What are the conditions for constructive and destructive interference of light? 3
- iii) A parallel beam of light of wavelength 5890\AA is incident on a glass plate having refractive index 1.5. The angle of refraction of plate is 60° . Calculate smallest thickness 't' of glass plate which will appear dark by reflected light. 2

OR

- B) a) Derive an expression for fringe width for interference fringes at wedge shaped film. 2½
- b) Explain Haidinger fringes and Fizeau fringes in thin film. 2½
- c) 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. 2½
- d) Explain the classification of interference of light by 2½
- i) Division of amplitude
 - ii) Division of wavefront

Either:

2. A) i) Explain the experimental arrangement to obtain Newton's rings. Obtain an expression for the diameters of bright and dark rings in reflected light. 6
- ii) In a Newton's ring experiment the diameter of the 5th rings was 0.336cm and diameter of 15th ring was 0.59cm. If the radius of curvature of planoconvex lens is equal to 100cm. Find the wavelength of light used. 2
- iii) Derive the expression for determination of wavelength of monochromatic light using Newton's rings. 2

OR

- B) a) Describe the construction of Michelson's interferometer. 2½
- b) What is the role of compensating glass plate in Michelson's interferometer. 2½
- c) When the movable mirror of Michelson's interferometer is moved by 0.05890mm a shift of 200 fringes is observed. What is the wavelength of light used? 2½
- d) Explain how Michelson interferometer can be used for determination of refractive index of thin transparent film. 2½

Either:

3. A) i) Explain Fraunhofer diffraction due to single narrow slit and obtain an expression for diffraction maxima and minima, find the width of the central principal maxima. 6
- ii) In an arrangement for Fraunhofer diffraction we use a slit of width 0.2mm and first minimum is at 5mm on either side of central maxima. If the distance between the lens and the screen is 2m., calculate the wavelength of light. 2
- iii) Explain the difference between Fraunhofer diffraction and Fresnel's diffraction. 2

OR

- B) a) Explain the construction of Fresnel's half period zone on plane wavefront. 2½
- b) What is zone plate? Describe the construction of zone plate. 2½
- c) A grating with 2500 lines per cm is illuminated at the normal incidence by light of wavelength 6000\AA . How many orders will be visible. 2½
- d) Determine the wavelength of monochromatic light by using diffraction of grating. 2½

Either:

4. A) i) Describe the construction and working of Nicol prism to obtain the polarized light. 5
- ii) If the refractive indices for ordinary and extra ordinary rays are 1.54 and 1.45 respectively. Calculate the minimum thickness of half wave plate for wavelength 5500\AA . 3
- iii) Explain double refraction in uniaxial crystals. 2

OR

- B) a) Explain the use of Nicol prism as an analyzer of plane polarized light. 2½
- b) A ray of light is incident on glass plate of refractive index 1.732 at a polarizing angle. Find the angle of incidence and angle of refraction. 2½
- c) State and prove Brewster's law. 2½
- d) Obtain an expression for thickness of quarter wave plate. 2½

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

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| a) What are coherent sources? | 1 |
| b) State the principle of superposition of wave. | 1 |
| c) What is Fresnel's biprism? | 1 |
| d) What is an interferometer? | 1 |
| e) Why the centre of Newton's Rings are dark in reflected light? | 1 |
| f) What are the application of Michelson interferometer? | 1 |
| g) What is diffraction of light? | 1 |
| h) Distinguish between interference and diffraction of light. | 1 |
| i) What is grating element? | 1 |
| j) What is mean by polarization of light? | 1 |
| k) What is double refraction? | 1 |
| l) What is phase retardation plate? | 1 |
