

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

P. Pages : 3

Time : Three Hours



GUG/W/24/12017

Max. Marks : 50

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

Either:

1. a) i) Define interference of light. Write the conditions for constructive and destructive interference of light. 2
- ii) Explain the interference of light in thin film due to transmitted light and obtain the condition for maxima and minima. 5
- iii) A soap film is illuminated by white light incident at an angle of 45° . The refractive index of the film is 1.333. 3
The light refracted by it is examined by a spectroscope and two consecutive bright bands are focused corresponding to wavelength 6.1×10^{-5} cm and 6.0×10^{-5} cm find the thickness of the film.

OR

- b) a) Define wavefront and state the properties of wavefront. 2½
- b) Explain the experimental arrangement to determine the wavelength of monochromatic light using Fresnel's Biprism. 2½
- c) A Biprism is placed at a distance of 5 cm. in front of a narrow slit illuminated by light of wavelength 5890 \AA and the distance between the virtual sources is found to be 0.05 cm. Find the width of the fringes observed in an eyepiece placed at a distance 75 cm. from the Biprism. 2½
- d) Explain formation of Haidinger's Fringes. 2½

Either:

2. a) i) What are Newton's rings? Explain the formation of Newton's ring and obtain expression for diameter of bright and dark rings. 5
- ii) Derive an expression for wavelength of monochromatic light using Newton's rings. 2
- iii) In Newton's ring experiment the diameter of 5th ring was 0.336 cm and diameter of 15th ring was 0.59 cm. If the radius of curvature of plano-convex lens is equal to 100 cm. Find the wavelength of light used. 3

OR

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| b) | a) | Describe the construction and working of Michelson's interferometer. | 2½ |
| | b) | Explain the determination of refractive index of the thin film using Michelson's interferometer. | 2½ |
| | c) | Explain Visibility of fringes. | 2½ |
| | d) | When the movable mirror of Michelson interferometer is moved by 0.0589 mm, a shift of 200 fringes is observed. What is the wavelength of light used? | 2½ |

Either:

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| 3. | a) | i) | What is Fresnel diffraction? | 1 |
| | | ii) | Explain Fresnel diffraction due to straight edge and obtain an expression for the intensity at various points on the screen. | 6 |
| | | iii) | A narrow slit illuminated by light of wavelength 5890 Å is located at a distance of 0.1 m from a straight edge. If the measurements are made at a distance of 0.5 m from the edge, calculate the distance between the first and second dark band. | 3 |

OR

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| b) | a) | What is Zone Plate? Show that the radii of its half period zones are directly proportional to the square root of natural numbers. | 2½ |
| | b) | What is diffraction grating? Obtain condition for maximum and minimum intensity on the screen due to diffraction at plane transmission grating. | 2½ |
| | c) | Explain the determination of wavelength of light with the help of plane transmission grating. | 2½ |
| | d) | A grating with 2500 lines per cm. is illuminated at normal incidence by light of wavelength 5500 Å. How many orders will be visible? | 2½ |

Either:

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| 4. | a) | i) | Define plane of polarization and plane of vibration of polarized light. | 2 |
| | | ii) | Discuss the production of plane polarized light by reflection and prove the Brewster's law. | 6 |
| | | iii) | 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 |

OR

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| b) | a) | Distinguish between the positive and negative crystal. | 2½ |
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| b) | How Nicol prism used as analyzer of plane polarized light? | 2½ |
| c) | Explain construction and working of quarter wave plate. | 2½ |
| d) | 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 Å. | 2½ |

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

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| a) | State the principle of superposition of light. | 1 |
| b) | How much phase will change on reflection from optically denser medium. | 1 |
| c) | What is thin film? | 1 |
| d) | Why the center of Newton's rings appears dark in reflected light? | 1 |
| e) | Why we use compensating glass plate in Michelson's interferometer? | 1 |
| f) | Write two applications of Michelson's interferometer. | 1 |
| g) | Define diffraction of light. | 1 |
| h) | Define grating element of plane transmission grating. | 1 |
| i) | Distinguish between zone plate and convex lens any two points. | 1 |
| j) | Define Polarization of light. | 1 |
| k) | What is biaxial crystal? Give its examples. | 1 |
| l) | What is half wave plate? | 1 |
