

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

P. Pages : 3

Time : Three Hours



GUG/W/24/12017(S)

Max. Marks : 50

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 the film, due to reflected rays of light. 6
- 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 in the glass plate is 60° . Calculate smallest thickness 't' of glass plate which will appear dark by reflected light. 2

OR

- b) a) Derive the expression for fringe width of interference pattern at wedge shaped thin film. 2½
- b) Two narrow and parallel slits 0.1cm apart are illuminated with a monochromatic light of wavelength 589.3nm. The interference pattern is observed at a distance of 25 cm from the slits. Calculate the fringe width. 2½
- c) Explain Haidinger's fringes and Fizeau fringes in thin film. 2½
- d) What is wavefront? Explain different types of wavefronts. 2½

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. 7
- ii) In the Newton's ring experiment using reflected light of diameter of 5th ring is 0.336 cm and that of the 15th ring is 0.59cm. If the radius of curvature of planoconvex lens is 99.83cm. Calculate wavelength of light. 3

OR

- b) a) Explain the construction of Michaelson's interferometer with neat diagram. 2½
- b) When movable mirror of Michelson's interferometer is shifted through 0.02897mm, a shift of 100 fringes is observed. Find the wavelength of light used. 2½

- c) Explain how to determine the Wavelength of monochromatic light using Michelson's Interferometer. 2½
- d) Explain the necessity of compensating glass plate in Michelson's interferometer. 2½

Either:

3. a) i) Explain Fraunhofer diffraction at single slit and obtain expression for position of central maxima, secondary maxima, and minima. 6
- ii) Explain the difference between interference and diffraction. 2
- iii) In Fraunhofer diffraction pattern due to a single slit a screen is placed 2m away from the lens to obtain the pattern. If the slit width 0.2mm and the first minima lies 5mm on either side of the central maximum. Find the wavelength of light. 2

OR

- b) a) Describe in detail how plane transmission grating is used to determine the wavelength of a monochromatic light. 2½
- b) Distinguish between Fresnel and Fraunhofer diffraction. 2½
- c) Show that the radii of half period zones are directly proportional to the square root of natural number. 2½
- d) Calculate the minimum number of lines in a grating which will just resolve the sodium lines in the first order spectrum. The wavelengths are 5890\AA and 5896\AA . 2½

Either:

4. a) i) State and Prove Brewster's law. 3
- ii) Explain double refraction in uniaxial crystals. 3
- iii) The refractive index of ordinary and extraordinary ray are 1.640 and 1.650 respectively. The thickness of the half wave plate is 1.2×10^{-3} cm. Calculate the wavelength of light used. 2
- iv) Explain Nicol prism used as analyser of plane polarized light. 2

OR

- b) a) What is quarter wave plate? Obtain an expression for thickness of a quarter wave plate. 2½
- b) For calcite $\mu_o = 1.648$ and $\mu_e = 1.486$ for sodium light. Calculate the minimum thickness of quarter wave plate for calcite (Given $\lambda = 5893\text{\AA}$). 2½

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| c) | Explain positive and negative crystal. | 2½ |
| d) | Explain the production of plane polarized light (PPL) by reflection. | 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 wavefront? | 1 |
| d) | Why the centre of newton's rings dark in reflected light? | 1 |
| e) | What is an interferometer? | 1 |
| f) | What will happen, if the plane glass plate is replaced by plane mirror in Newton's rings experiment? | 1 |
| g) | Define grating element. | 1 |
| h) | Distinguish between interference and diffraction. | 1 |
| i) | What is plane transmission grating? | 1 |
| j) | What is double refraction? | 1 |
| k) | Define biaxial crystal with example. | 1 |
| l) | What is optic axis. | 1 |
