

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

P. Pages : 3

Time : Three Hours



GUG/S/25/12017

Max. Marks : 50

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

Either:

1. A) i) State the condition for obtaining steady interference pattern. 2
- ii) Explain the phenomenon of interference in thin film due to reflected light and obtain the condition for bright and dark fringes. 4
- iii) Show that in thin film reflected and transmitted interference pattern are complementary in nature. 2
- iv) The light of wavelength 5893 Å falls on a thin glass plate ($\mu = 1.5$) such that the angle of refraction is 60 degree. Find the minimum thickness of the plate appears dark in the reflected light. 2

OR

- B) a) Describe an experiment to determine the wavelength of monochromatic light using bi-prism. 2½
- b) Derive an expression for fringe width obtained in wedge shape film. 2½
- c) Explain the classification of interference of light by 2½
- i) Division of wave front and
- ii) Division of amplitude
- d) A bi- prism is placed at distance of 5 cm in front of narrow slit illuminated by sodium light of wavelength 5890 Å. U. and 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 bi- prism. 2½

Either:

2. A) i) Explain the experimental arrangement to obtain Newton's rings. Show that the diameter of bright rings is directly proportional to the square root of odd natural numbers 6
- ii) How will you determine the wavelength of monochromatic light by using Newton's rings experiment. 2
- iii) In Newton's ring experiment, the diameter of 23rd rings was found to be 0.501 cm and that of 3rd ring was 0.181 cm. If the radius of curvature of plano-convex lens is 0.5m. Calculate the wavelength of light used. 2

OR

- B) a) Describe the construction of Michelson's Interferometer. 2½
- b) How will you determine the wavelength of monochromatic light using Michelson's Interferometer. 2½
- c) Distinguish between Newton's rings and Michelson's Interferometer rings. 2½
- d) In Michelson's interferometer, 100 fringes cross the field of view, when the movable mirror is displaced distance 0.02948 mm. calculate the wavelength of monochromatic light used. 2½

Either:

3. A) i) What is diffraction of light? State the essential condition for Fraunhofer diffraction. 2
- ii) Explain the Fraunhofer diffraction at a single slit. Hence obtain an expression for a width of central maxima. 6
- iii) In an experiment of Fraunhofer diffraction, we used a slit of width 0.2 mm and first minima is at 5mm on either side of central maxima. If the distance between lens and screen is 2 m, calculate the wavelength of light used. 2

OR

- B) a) Derive an expression of focal length of zone plate. 2½
- b) Distinguish between a zone plate and convex lens. 2½
- c) Show that area of each half period zone are nearly equal. 2½
- d) Calculate the radius of first zone of zone plate of focal length 0.2 m for a light of wavelength 5000 Å. 2½

Either:

4. A) i) What is Nicol prism? Describe the principle, construction and working of Nicol prism. 6
- ii) How Nicol prism used as analyser of plane polarized light. 2
- iii) The light is incident on a glass plate of refractive index 1.53 at the polarizing angle. Calculate the angle of refraction of light. 2

OR

- B) a) State and prove Brewster's law. 2½
- b) Distinguish between the positive and negative crystals. 2½
- c) Derive an expression for thickness of quarter wave plate. 2½
- d) If the refractive indices for ordinary and extra ordinary rays are 1.54 and 1.45. 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 waves. | 1 |
| c) State the condition for getting interference of light. | 1 |
| d) Write the principle of Michelson's Interferometer. | 1 |
| e) What is the use of compensating glass plate in Michelson's Interferometer? | 1 |
| f) What will happen when monochromatic light is replaced by white light in Newton ring experiment ? | 1 |
| g) Define diffraction of light. | 1 |
| h) Define grating element of plane transmission grating. | 1 |
| i) What is zone plate? | 1 |
| j) Define uniaxial crystal. Give its example. | 1 |
| k) What is half wave plate? | 1 |
| l) Define polarization of light. | 1 |
