

Five Year Integrated M.Sc. Examination, 2019

Semester - II

Course: PH-1-2-1

(Physical Optics)

Time: Three Hours

Full Marks: 60

Questions are of value as indicated in the margin.

Answer **Question No.1** and **any five** from the rest.

1. Answer **any five** from the following: 5x2=10
 - a) What is the basic criterion for producing sustained interference and why?
 - b) Is the principle of conservation of energy violated in interference? Explain.
 - c) What should be the colour of the central spot in Newton's rings and why?
 - d) Explain the basic difference between Fresnel diffraction and Fraunhofer diffraction.
 - e) State and explain Brewster's law.
 - f) What do you mean by unpolarized and polarized light. Explain.
 - g) If the plane of vibration of an incident light makes an angle 30° with the optic axis of a calcite plate, compare the intensities of E-ray and O-ray.
2.
 - a) Describe how you can measure the thickness of a thin mica sheet with the help of interference of two coherent sources of light.
 - b) In Young's double-slit experiment, distance between the two slits is 0.03 mm, wavelength is 500 nm and distance of the screen from the slits is 40 cm. Calculate the fringe width. 7+3 = 10
3.
 - a) Explain how Newton's rings are formed in the reflected light and describe in brief how these are used to determine the wavelength of monochromatic light.
 - b) In Newton's ring experiment, the diameter of the 14th ring is found to be 0.550 cm and that of the 4th ring is 0.345 cm. If the wavelength of the monochromatic light used is 589 nm, calculate the radius of the plano-convex lens. 7+3 = 10
4. Explain the principle of Fabry-Perot interferometer. Obtain an expression for the intensity of the transmitted light through the interferometer and discuss the sharpness of the fringes obtained in terms of the reflectivity parameter (with diagram). 10
5.
 - a) Discuss Fraunhofer diffraction due to single slit. Obtain the conditions of maxima and minima. Draw the intensity distribution curve.
 - b) Write a short note on plane transmission grating. 7+3 = 10
6.
 - a) What do you mean by double refraction of light? Distinguish between the properties of ordinary and extraordinary rays.
 - b) Explain the working principle of a quarter wave plate.
 - c) How can you produce elliptically and circularly polarized light by using a quarter wave plate? (2+2)+3+3 = 10
7.
 - a) Write a short note on circular dichroism.
 - b) What do you mean by optical rotation of light? Explain the basic principle for the measurement of optical rotation of an optically active medium.
 - c) Write down the laws of optical rotation. 2+(2+4)+2 = 10
8.
 - a) What are the basic characteristics of laser?
 - b) What is the necessary condition of a laser? Explain.
 - c) Why a two-state laser is not possible?
 - d) Explain the working principle of a laser with component-wise diagram and energy diagram. 2+3+1+4 = 10