

Five Year Integrated M.Sc. Examination, 2017

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 four** from the rest.

1. Answer **any ten** from the following: 2x10=20
 - a) Why two light sources must be coherent to produce sustained interference?
 - b) Two straight and narrow slits 3 mm apart are illuminated with a monochromatic source of wavelength 600 nm. Fringes are obtained at a distance of 50 cm from the slits. Find the fringe-width.
 - c) What should be the colour of the central fringe in Newton's rings and why?
 - d) In the Michelson interferometer, if one of the mirrors is moved by a distance of 0.08 mm, 250 fringes cross the field of view. Calculate the wavelength of light.
 - e) What is the effect of increasing the slit width on the Fraunhofer diffraction due to single slit?
 - f) Explain the concept of primary wavefront and secondary wavelets.
 - g) How does Fraunhofer class of diffraction differ from Fresnel class?
 - h) When plane waves from a monochromatic source fall normally on a plane grating with 500 lines per mm, it is observed that the second order spectral line is deviated through 30° . Find the wavelength of the source of light.
 - i) If a half-wave plate and a quarter-wave plate are given to you, how would you distinguish them from each other?
 - j) State and explain Brewster's law.
 - k) How does the polarization phenomenon establish that light waves consist of transverse vibrations?
 - l) What are the characteristics of a LASER?
2.
 - a) Describe how can you measure the thickness of a thin mica sheet with the help of interference of two coherent sources of light. 7
 - b) Interference fringes are produced with monochromatic light of wavelength 689 nm. A thin film of glass of refractive index 1.52 is placed normally in the path of one of the interfering beams. The central bright fringe is found to be shifted to a position occupied by the fifth bright band from the centre. Calculate the thickness of the glass film. 3
3. Draw a neat sketch of the arrangement for a Fabry-Perot interferometer and explain its working principle. Obtain the conditions of maxima and minima. 10
4.
 - a) Discuss Fraunhofer diffraction due to single slit. Obtain the conditions of maxima and minima. Draw the intensity distribution curve. 7
 - b) A zone plate has a radius of the first ring 0.05 cm. If plane wave of wavelength 500 nm falls on the plate, where should the screen be placed so that light is focused to a bright spot? 3
5.
 - a) What do you mean by double refraction of light? Distinguish between the properties of ordinary and extraordinary rays. 5
 - b) Explain the working principle of Nicol prism. 5
6.
 - a) What is the necessary condition of a laser? Explain. 3
 - b) Explain the working principle of Ruby laser with energy level diagram. Why the output of the laser is spiked and pulsed? Explain. 7