2012
B.A./B.Sc. (General) Third Semester
Physics
Paper – B: Optics and Lasers – I

Time allowed: 3 Hours

Max. Marks: 44

NOTE: Attempt five questions in all, including Question No. VII (Unit-III) which is compulsory and selecting two questions each from Unit I - II. Use of non- programmable scientific calculator is allowed.

x-x-x

UNIT – I

I.   a) Describe Young's double slit experiment and find an expression for fringe width. Also discuss the consequences of result:

b) If Young's double slit apparatus is immersed in water, what will happen to fringe width?   (6,3)

II. a) Describe Fabry-Perot Interferometer and derive an expression for intensity distribution in fringes.

b) In Newton's rings experiment the diameter of 10th ring changes from 1.40 cm to 1.27 cm when a liquid is introduced between the lens and the plate. Calculate the refractive index of the liquid.   (6,3)

III. a) Explain analytically the colour of thin films. Why are the colours of reflection and transmission patterns complementary?

b) A biprism is placed 10 cm from a slit illuminated by sodium light (λ = 589 nm). The width of the fringes obtained on a screen 1.1 m away from the biprism is 0.09 cm. What is the distance between the coherent sources?   (6,3)

UNIT - II

IV. a) Define resolving power. Derive an expression for the resolving power of a grating.

b) Distinguish between Fresnel and Fraunhoffer type of diffraction.   (6,3)

V.   a) What is zone plate? Show that the radii of its half period zones are proportional to the square root of natural numbers.

b) State and derive Brewster's law. Explain the working of a wire grid polariser.   (6,3)

P.T.O.

VI. a) State and explain Malus law. If the angle between a polarizer and analyser is 60°, what will be the intensity of light transmitted, having original intensity Io incident on the polariser.

b) Prove Brewster's law. What does the Brewster's law become when the rays of light travel from denser to rarer medium?   (6,3)

UNIT - III

VII. Attempt any eight of the following:-

a) In Michelson's Interferometer 500 fringes cross the field of view when movable mirror is displaced through 0.147 mm. What is the wavelength of monocromatic light used?

b) If we wet a glass plate, the film appears non-reflecting for a short while as the water evaporates. Explain why?

c) What is the thickness of a non-reflecting film in terms of λ?

d) What do you mean by visibility of fringes?

e) If two coherent sources are infinitely close to each other, what happens to the interference pattern?

f) Why do we call Fresnel's zones as half period zones ?

g) What is moire fringes?

h) What is the nature of diffraction pattern obtained due to diffraction at a circular aperture?

i) Can our eye distinguish between polarised light from unpolarised light?

j) What is dichorism?   (8x1)

x-x-x