

BACHELOR OF SCIENCE EXAMINATION, 2018(2nd Year 1st Semester)

PHYSICS (Subsidiary)

Paper: SO6

Time: 2 Hours

Full Marks: 50

Answer any four questions

1. a) Show that the dark and bright fringes produced in Young's double slit experiment are equally spaced.
 b) Deduce an expression for the displacement of the fringes due to insertion of a thin transparent sheet in the path of one of the interfering beams.
 c) A thin glass sheet of refractive index 1.5 and thickness $6\text{ }\mu\text{m}$ is introduced in one of the paths of interfering beams. If the central fringe shifts by 5 bands, find the wavelength of light.
 $4+4.5+4=12.5$
2. a) Obtain an expression for the diameter of dark rings in reflected system in Newton's ring experiment.
 b) How can refractive index of a transparent liquid be determined in this experiment?
 c) In a Newton's ring experiment, the diameter of 10th ring changes from 1.40 cm to 1.27 cm on introduction of a liquid drop between the lens and the glass plate. Calculate the refractive index of the liquid.
 $4.5+4+4=12.5$
3. a) Discuss Fraunhofer diffraction at a single slit. Assuming the expression for intensity distribution obtain the condition for diffraction minima.
 b) What particular orders would be absent if the width of transparencies and opacities of a double slit are equal?
 c) Show that in a diffraction grating with grating element $1.5 \times 10^{-6}\text{ m}$ and light of wavelength 500 nm, the third and higher order principal maxima are not visible.
 $4.5+4+4=12.5$
4. a) Prove the laws of reflection of light on the basis of Huygen's principle.
 b) What is Brewster's law? Show that when a ray is incident at the Brewster's angle, the reflected ray is perpendicular to refracted ray.
 $6.5 + (2+4) = 12.5$
5. a) Distinguish between polarized light and unpolarized light. What is a quarter-wave plate? How can you produce plane polarized light and circularly polarized light?
 b) Light travelling in water of refractive index 1.33 is incident on a glass plate of refractive index 1.53. At what angle of incidence the reflected light is completely polarized?
 $(2+2+4.5)+4=12.5$
6. Write short notes on (any two): 12.5
 - a) Fresnel biprism
 - b) Plane diffraction grating
 - c) Nicol prism
 - d) Huygen's principle