Day : Saturday   Time : 10:00 AM-01:00 PM

Date : 10/12/2022   **W-18348-2022**   Max. Marks : 60

N.B.
1) All questions are **COMPULSORY**.
2) Figures to the **RIGHT** indicate **FULL** marks.
3) Draw diagrams **WHEREVER** necessary.
4) Use of scientific calculator and log table is **ALLOWED**.

Q.1 Answer **ANY TWO** of the following.   (12)
a) Derive Lens maker's formula for a thin lens.
b) Explain the working of Huygen's eyepiece with necessary diagram.
c) Explain the phenomenon of destructive interference in thin film of constant thickness. Obtain the formula for optical path difference between two consecutive reflected rays.

Q.2 Answer **ANY TWO** of the following.   (12)
a) Explain the phase change on reflection of light from boundary of denser medium on the basis of Stoke's treatment.
b) State Brewster's law and explain how it can be used to produce the plane polarized light.
c) i) Define the terms : Optical centre, Principal axis and radius of curvature.
   ii) Two thin converging lenses of focal lengths 15 cm and 20 cm are co-axially 10 cm apart. An object is placed at a distance of 15 cm from the first lens. Find the positions of focal points, principal points and the position of the image.

Q.3 Answer **ANY TWO** of the following.   (12)
a) Explain Fraunhoffer's diffraction at a double slit. Derive an expression for intensity distribution and find the position of maxima and minima.
b) Give the theory of plane transmission grating. Explain the conditions under which principal maxima will occur.
c) Distinguish between interference and diffraction. Obtain the condition $2\mu t \cos r = m\lambda$ for destructive interference in the reflected system of rays from a thin film.

Q.4 Answer **ANY THREE** of the following.   (12)
a) Prove that the diameters of the Newton's dark rings are proportional to square roots of natural numbers.
b) Explain in brief the theory of quarter wave plate and half wave plate.
c) State four points of difference between Fresnel and Fraunhoffer diffraction.
d) A converging lens of focal length 6.25 cm is used as a magnifying glass. If the near point of the observer is 25 cm from the eye and the lens is held close to the eye, calculate
   i) the distance of the object from the lens
   ii) the angular magnification.

..2

Q.5 Answer **ANY FOUR** of the following.   **(12)**

   a) State three points of difference between positive and negative crystal.

   b) What are the uses of polaroid? Find the polarizing angle for light incident from water to glass and glass to water if refractive indices of glass and water are 1.54 and 1.33 respectively.

   c) Distinguish between interference and diffraction.

   d) Calculate the magnifying power of a magnifying glass of 6.25 cm focal length. The distance of distinct vision is 25 cm.

   e) A soap film of refractive index 4/3 and of thickness 1.5×10^{-6} m is illuminated by white light incident at an angle of 45^0. The light reflected by it is examined by spectrometer in which is found a dark band corresponding to wavelength of 5×10^{-7} m. Calculate the order of interference bands.

   f) In Newton's rings experiment the diameter of the 10th dark ring is found to be 4 mm. The radius of curvature of the plano-convex lens is 100 cm. Assuming the intervening medium to be air, calculate the wavelength of light.

<div align="center">*   *   *   *   *</div>