BACHELOR OF SCIENCE (CBCS-2018 COURSE)
S. Y. B. Sc. Sem-III : WINTER :- 2021
SUBJECT: PHYSICS : OPTICS

Day : Saturday
Date 22-01-2022

W-18348-2021

Time : 10:00 AM-01:00 PM
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) Explain the formation of interference fringes due to a wedge-shaped film. Derive the formula for the fringe width.

b) Define cardinal points of a co-axial lens system. Two thin convex lenses of focal lengths 13 cm and 15 cm are co-axially 9 cm apart. An object is placed at a distance 24 cm from the first lens.
Find
i) The position of focal points
ii) The position of principal points
iii) The position of the image

c) Explain the working of Ramsden's eyepiece. State its drawbacks.

Q.2 Answer **ANY TWO** of the following. **(12)**

a) Derive Lens maker's formula for a thin lens.

b) Explain Newton's rings formation and prove the relation, $\lambda = \frac{Dm^2 - Dn^2}{4(m-n)R}$ where symbols have their usual meanings.

c) State Brewster's law and explain how it can be used to produce the plane polarized light.

Q.3 Answer **ANY TWO** of the following. **(12)**

a) Explain interference and diffraction phenomenon. White light is incident on two parallel glass plates separated by air film of 0.001 cm and reflected light is examined by spectrometer. Find the number of dark bands seen in spectrum between the wavelengths 4×10^{-7} m and 7×10^{-7} m; when light is incident at an angle 30^0 to the normal of the surface.

b) Explain Fraunhoffer's diffraction at a double slit. Derive an expression for intensity distribution and find the positions of maxima and minima.

c) Derive the formula for equivalent focal length of two thin lenses placed co-axially in the medium air and separated by a finite distance.

Q.4 Answer **ANY THREE** of the following. **(12)**

a) A lens made up of glass of refractive index 1.5 has two spherical surfaces, one convex of radius of curvature 25 cm and other concave of radius of curvature 75 cm. Find the nature and focal length of the lens.

b) Distinguish between polarized light and unpolarized light. State Brewster's law.

c) What is plane diffraction grating? Define grating element.

d) Explain Rayleigh's criterion of resolution with suitable examples.

..2

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

a) In Newton's ring experiment, the diameter of the 10^{th} 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.

b) Explain the theory of quarter wave plate.

c) What are the uses of polaroid? A glass plate is to be used as a polarizer. Find the angle of polarization for it. Also find the angle of refraction if the refractive index for glass is 1.54.

d) In Newton's rings experiment, the diameters of two successive rings formed by light of wavelength 5893 Å were obtained as 4 mm and 4.2 mm. Calculate the radius of curvature of the plano-convex lens.

e) Two thin convex lenses each of focal length 10 cm are placed co-axially at a distance of 10 cm apart. Calculate the equivalent focal length of given combination of lenses.

f) Define magnifying power of a simple microscope. State the limitations of it.

* * * * *