

BACHELOR OF SCIENCE (CBCS-2018 COURSE)

S. Y. B. Sc. Sem-III :SUMMER- 2022

SUBJECT : PHYSICS : OPTICS

Day : Thursday

Date : 7/7/2022

S-18348-2022

Time : 03:00 PM-06:00 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 calculator and log table is **ALLOWED**.

Q.1 Answer **ANY TWO** of the following : (12)

- a) Define resolving power of the instrument. Explain Rayleigh's criteria for resolution.
- b) Explain the phenomenon of interference in thin film due to transmitted light. Obtain the conditions for maxima and minima.
- c) Explain the construction and use of Ramsden's eye-piece. Why it is termed as a positive eye-piece.

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

- a) Explain Fraunhofer's diffraction at a double slit. Derive expression for intensity distribution.
- b) Derive lens makers formula for a thin lens.
- c) Prove that for a combination of any two thin lenses of focal lengths f_1 and f_2 separated by a distance x , the focal length of the combination is given by :
$$\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{x}{f_1 f_2}$$

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

- a) 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 5 cm from the first lens. Find
 - i) The position of focal points.
 - ii) The position of principal points.
 - iii) The position of the image.
- b) How do you determine the refractive index of a liquid by using Newton's rings apparatus? Will the diameter of a Newton's ring increase or decrease due to introduction of liquid?
- c) The total magnification produced by a compound microscope is 20, while that produced by the eye-piece alone is 5. When the microscope is focused on a certain object, the distance between the objective and the eye-piece is 14 cm. Find the focal length of the objective and eye-piece, if distance of distinct vision is 20 cm.

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

- a) Explain the working of simple microscope. Also define minimum magnifying power and maximum magnifying power for it.
- b) State four points of comparison between Fresnel's diffraction and Fraunhofer's diffraction.
- c) Explain the types of retardation plates.
- d) Explain Brewster's Law and state its applications.

P.T.O.

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

- a) An equivalent focal length of Huygen's eye-piece is 6 cm. what will be the focal lengths of the individual lenses?
- b) State three points of comparison between positive and negative crystal.
- c) A thin convex lens of focal length 15 cm is kept coaxially at a distance of 10 cm from a concave lens of focal length 10 cm. Locate the cardinal points.
- d) Newton's rings are formed between plane glass plate and plano-convex lens of radius 60 cm. If diameter of 3rd bright ring is 0.0018 m and that of 23rd bright ring is 0.005m, calculate the wavelength of light.
- e) The focal length of a lens in air is 15 cm. what will be its focal length if air is replaced by water.
- f) Define the following terms :
 - i) Diffraction grating
 - ii) Transmission grating
 - iii) Grating element.
