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School of Basic Sciences
Bachelor of Science Honours in Physics
Semester End Examination - Jun 2024

Duration : 180 Minutes
Max Marks : 100

Sem IV - C1UD405T - Optical Instruments and Applications

General Instructions

Answer to the specific question asked

Draw neat, labelled diagrams wherever necessary

Approved data hand books are allowed subject to verification by the Invigilator

- 1) Refractive index of glass is 1.5. Calculate Brewster's angle for it. Also calculate the angle of refraction K1 (3)
- 2) Explain chromatic aberration in a lens. K2 (4)
- 3) Find the equivalent focal length of a combination of two convex lenses placed in contact. K2 (6)
- 4) Explain what happens when an elliptically polarised light is passed through a quarter wave plate. K3 (6)
- 5) An unpolarised plane light wave of intensity 10 mW/cm^2 passes through two nicols with the principal sections at 30° to each other. Calculate the intensity of the transmitted wave. K3 (6)
- 6) Describe the construction and action of Nicol prism. Mention drawbacks of Nicol prism. K3 (9)
- 7) Describe how quarter wave and half wave plates are made? Explain their uses in the study of different types of polarised light. K3 (9)
- 8) Determine the positions of the focal points, principal points and nodal points in the case of sphere of radius 12 cm. ($\mu=1.5$) K4 (8)
- 9) Explain how the state of polarisation of a given beam of light can be determined with the help of a Nicol prism and quarter wave plate. K4 (12)
- 10) Give Fresnel's explanation of rotation of plane of polarisation by an optically active substance. K5 (10)

- 11) Explain the construction of a Huygens eyepiece. Why cannot a cross-wire be used with it? K5 (15)

OR

Two Nicol prisms are so arranged that the amount of light transmitted through them is maximum. What will be the percentage reduction in the intensity of the incident light when the analyser is rotated through (i) 30° (ii) 45° (iii) 60° and (iv) 90° ? K5 (15)

- 12) Find the condition of achromatism for two thin lenses in contact. Show that if those of two lenses are made of same material then the condition will behave as transparent plate. K6 (12)

OR

Two thin lenses of focal lengths f_1 and f_2 separated by a distance " d " have an equivalent focal length 50 cm. The combination satisfied the conditions for no chromatic aberration and minimum spherical aberration. Find the values of f_1 , f_2 and d . Assume that both the lenses are of the same material. K6 (12)