Mid-West University

Examinations Management Office

End Semester Examination 2081

Bachelor level/ B. Sc. /5th Semester — Full Marks: 60

Time: 3 hours — Pass Marks:30

Subject: Optics (PHY451)

Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks.

Group - A

Attempt all long answer questions. **[4x6 = 24]**

1. Describe the Michelson interferometer and explain the formation of fringes in it. In Michelson interferometer 200 fringes cross the field of view when the movable mirror is moved through 0.0589 mm. Calculate the wavelength of light used?
2. Define plane, elliptically and circularly polarized lights? Explain with necessary theory, how to obtain plane, elliptically and circularly polarized light.

OR

Explain how a Nicol prism is used to produce and analyses plane polarized light.

3. Define eyepiece and Give the construction and necessary theory of Ramsden's eyepiece.
4. Explain Rayleigh criterion for resolution and determine the resolving power of the telescope.

Group - B

Attempt all numerical answer questions. **[6x4 = 24]**

5. The dispersive powers for crown and flint glass are 0.015 and 0.030 respectively. Calculate the focal lengths of the lenses (made of crown and flint glass) which forms an achromatic doublet of focal length 60 cm when placed in contact.
6. Quartz has refractive indices 1.553 and 1.544. Calculate the thickness of quarter wave plate for sodium light of wavelength 5890Å.

OR

A soap film of refractive index 1.33 and of thickness 1.5×10^{-4}cm is illuminated by white light incident at an angle of 60°. The light reflected by it is examined by a spectroscope in which is found a dark band corresponding to a wavelength of 5×10^{-5}cm. Calculate the order of interference of the dark band.

7. In double slit Fraunhoffer diffraction pattern of single slit, the screen is placed 100 cm away from the slit and the slit is illuminated with light (λ=5893Å). The width of slit is 0.1mm. Calculate the separation between central maximum and the first secondary minimum?
8. What is zone plate? Derive an expression for its focal length. Show that a zone plate has multiple foci.
9. Calculate the values of Cauchy's constant A and B for crown glass and flint glass , Given

$$\mu_c = 1.514 \qquad \mu_F = 1.524$$
$$\lambda_c = 6563\ A^0 \qquad \lambda_F = 4862\ A^0$$

10. A lass wedge of angle 0.01rad is eliminated by monochromatic light of wavelength 6000Å falling normally on it. At what distance from the edge of wedge will the tenth fringe be absorbed by reflected light.