

**FOURTH SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2016**

(CUCSS)

Physics

PH 4E 18—MODERN OPTICS

(2012 Admission onwards)

Time : Three Hours

Maximum : 36 Weightage

**Part A***Answer all questions.**Each question carries 1 weightage.*

1. What is Partial Polarization ? Define degree of polarization.
2. Explain group velocity. Give its characteristics.
3. Briefly discuss scattering and polarization of light.
4. What is the principle of superposition ?
5. What is Spatial Coherence ?
6. What are antireflecting films ?
7. How much resolving power can a Fabry Perot interferometer achieve? Compare it with that of a Prism.
8. Distinguish between Fresnel and Fraunhofer diffraction.
9. Explain Rayleigh criterion for optical resolution.
10. Distinguish between Phase contrast and Phase gratings.
11. Explain Babinet's principle. Give an application.
12. What is interaction length ?

(12 × 1 = 12 weightage)

**Part B***Answer any two questions.**Each question carries 6 weightage.*

1. Discuss the propagation of electromagnetic waves in anisotropic media. Derive the relations between D and E.
2. What is Fourier transform spectroscopy ? Describe the arrangement for the study of Fourier transform spectroscopy and calculate the Fourier transform of the intensity function.

**Turn over**

3. Derive the Fresnel Kirchhoff formula. Huygen's principle could not account for the absence of a backward wave in diffraction. Why ?
4. What is optical activity ? Explain Faraday rotation in solids. Distinguish between Kerr effect and Pockel's effect.

(2 × 6 = 12 weightage)

### Part C

*Answer any **four** questions.  
Each question carries 3 weightage.*

1. Explain how the eigen vectors of Jones matrices are determined.
2. Derive the formulas

$$(a) \quad u_0 = u - \lambda \frac{du}{d\lambda}.$$

$$(b) \quad \frac{1}{u_0} = \frac{1}{u} - \frac{\lambda_0}{C} \frac{d_n}{d\lambda_0}.$$

3. What are antireflecting films ? Explain how high reflectance is obtained in a multilayer film ?
4. State and prove Kirchoff's integral theorem.
5. The plates of a Fabry-Perot interferometer are coated with silver of reflectance 0.9. if the transmittance and absorption is 0.05 find the maximum and minimum transmittance and resolving power of the interferometer. Given the plate separation is 1 cm and wavelength is 500 nm.
6. Explain why the relation between the polarizing field and radiation field becomes non-linear. Obtain the equation for nonlinear Polarization.

(4 × 3 = 12 weightage)