C 82508 (Pages : 2) Name.....

Reg. No.....

FOURTH SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2015

(CUCSS)

Physics

PHY 4E18—MODERN OPTICS

(2012 Admissions)

Time : Three Hours Maximum : 36 Weightage

Part A

Answer **all** *questions.*
Each question carries a weightage of 1.

1. What is linear polarization of an electromagnetic wave ?
2. What is Partial Polarization ? Define degree of polarization.
3. Distinguish between Phase velocity and Group velocity.
4. What is the principle of superposition ?
5. Define Coherence length and Coherence time.
6. What is multiple beam interference ?
7. How much resolving power can a Fabry Perot interferometer achieve ? Compare it with that of a Prism.
8. What are Complimentary apertures ? Hence State Babinet's theorem.
9. Explain Rayleigh criterion for optical resolution.
10. What is a zone plate ? Give its practical application.
11. Explain the phenomenon of double refraction. What are double prisms ?
12. What is interaction length ?

(12 × 1 = 12 weightage)

Part B

Answer any **two** *questions.*
Each question carries a weightage of 6.

1. What are Jones matrices ? How is it normalized ? Discuss two applications of the Jones notation.
2. Discuss the propagation of electromagnetic waves in anisotropic media. Derive the relations between D and E.

Turn over

3. Using the theory of partial coherence derive expressions for the degree of Partial coherence and fringe visibility.
4. Describe the Fabry-Perot interferometer. Explain how interference fringes are obtained. Obtain the equation for free spectrl range.

(2 × 6 = 12 weightage)

Part C

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

1. Show that the average pointing flux is given by where E_0 and H_0 are the complex field amplitudes of a light wave.
2. Briefly explain the working of Hanbury-Brown Twiss intensity interferometer.
3. A filter is used to obtain approximately monochromatic light from a white source. If the pass band of the filter is 10 nm, what is the coherence length and the coherence time of the filtered light ? The mean wavelength is 600 nm.
4. Prove that in the case of diffraction due to a single slit the angular width of the diffraction pattern varies inversely with the slit width.
5. What is apodization ? What is it use ? Show the aperture functions for a slit and an apodized slit.
6. Explain second harmonic generation in relation to nonlinear optics. What are its applications ?

(4 × 3 = 12 weightage)