28/1/15

Uni. Roll No.......................................

Course: B.Tech, I-Year, I - Mid Term (Even Sem.) Examination, 2014-15
Subject: Engineering Physics (AHP-103)

Time: 90 Minutes   M. M: 20

Notes:-
1. Answer all five questions from **Section A, Any three** from **Section B** and **Any three** from **Section C**.
2. All questions of a particular section should be answered collectively at one place.
3. Answer should be to-the-point and whatever required supplemented with neat sketches.
4. Any missing data may be assumed suitably giving proper justification.
5. Figures on the right-hand side margin indicate marks.

Section-A

Attempt all five questions.   1 × 5 = 5

(I) Plot the intensity distribution curve obtained due to the overlap of two identical light waves.

(II) Two identical waves having phase difference of $\pi/2$ interfere at a point. If the resultant intensity is 8 units, then calculate the amplitude of each wave.

(III) What would be the intensity of emergent polarized light if a plane polarized light of intensity I_0 is analysed through an analyser whose plane is parallel to the plane of incident polarized light?

(IV) Write down the formula used for the calculation of thickness of the half wave plate.

(V) Calculate the acceptance angle of an optical fibre whose numerical aperture is 0.5.

(P.T.O.)

Section-B

Attempt any three questions. $2 \times 3 = 6$

(I) Two coherent waves of amplitudes 3 and 4 units produce interference pattern. Calculate the intensity at a point one quarter of the distance between two fringes from the centre.

(II) The inclined faces of a prism ($\mu = 1.5$) make an angle of 2^0 with the base of the prism. The slit is 10 cm from the biprism and is illuminated by light of wavelength $\lambda = 5500$ Å. Find the fringe width at a distance of 1 m from the biprism.

(III) In Newton's ring experiment the diameter of 4th and 10th dark rings are 0.40 cm and   0.60 cm   respectively. Deduce the diameter of 20th dark ring.

(IV) The plane of polarization of polarized light is rotated through 10^0 in passing through a length of 10 cm of sugar solution of 10% concentration. Find the specific rotation of cane sugar solution.

Section-C

Attempt any three questions. $3 \times 3 = 9$

(I) In an Interference pattern, the fringes are obtained using the device of Fresnel's biprism. Obtain the expression to determine the fringe- width in terms of the separation of two coherent sources.

(II) Derive an expression to determine the diameters of the bright rings obtained in Newton's rings experiment and hence deduce the formula for finding the wavelength of the source of light.

(III) Discuss theoretically the superposition of two linearly polarized light waves travelling in the same direction when the optical vectors are mutually perpendicular. Also show that the plane polarized light is the special case of elliptically polarized light.

(IV) Obtain an expression for acceptance angle of an optical fibre for which the refractive indices of the material of core and cladding layers are μ_1 and μ_2 respectively. Compute the numerical aperture of an optical fibre using data: μ_1 (core) $= 1.48$ and μ_2 (cladding) $= 1.46$.