GLA University, Mathura

II-Mid Term Examination, 2011-12

Course: - B.Tech I-Year, I-Sem.

Subject: - Physics -I **Uni. Roll No:-**

Time:-90 Minutes **Total Marks:- 40**

Notes:-

1) Answer all questions, Group A is **compulsory**, **Any Two** from Group B and **Any Two** from Group C.
2) All parts of a question (a, b, etc.) should be answered at one place.
3) Answer should be brief and to-the-point and be supplemented with neat sketches.
4) Any missing or wrong data may be assumed suitably giving proper justification.
5) Figures on the right-hand side margin indicate full marks.

Group A

Q.1 16×1= 16

(i) Which of the following is conserved when light waves interfere ?
(a) amplitude (b) intensity (c) energy (d) momentum

(ii) For constructive interference, phase difference between two coherent sources must be
(a) $2n\pi$ (b) $(2n+1)\pi$ (c) $(2n-1)\pi/2$ (d) $(2n^2-1)\pi/2$

(iii) In young's interference experiment, n^{th} order bright fringes of wavelengths λ_1 and λ_2 are forming at distances x and y from the central bright fringe respectively. The ratio between wavelengths (λ_1/λ_2) is
(a) x/y (b) y/x (c) y^2/x^2 (d) x^2/y^2

(iv) In biprism experiment, the two slits are at a distance d apart. Interference pattern is observed at a distance D from the slits. At a point on the screen directly opposite to one of the slits, a dark fringe is observed. Wavelength of the wave is nearly
(a) $\frac{d}{D}$ (b) $\frac{D}{d}$ (c) $\frac{d^2}{D}$ (d) $\frac{D}{d^2}$

(v) Intensity in biprism experiment set up at central bright fringe is I_0. If one of the two sources is covered then intensity at this point will be
(a) I_0 (b) $I_0/4$ (c) $I_0/2$ (d) $4I_0$

(vi) In which of the following interference is produced by the divison of wavefront ?
(a) Fresenel biprism experiment (b) Young's double slit experiment (c)Newton's ring (d) None of these

(vii) Condition for bright fringes in case transmitted light in parallel film will be
(a) $2\mu t \cos r = n\lambda$ (b) $2\mu t \cos r = (2n-1)\lambda/2$ (c) $2\mu t^2 \cos r = n\lambda$ (d) $2\mu t^2 \sin r = n\lambda$

(viii) In case of wedge shaped film, the shape of interference fringes will be
(a) circular (b) elliptical (c) hyperbolic (d) straight line

(ix) Newton's ring are
(a) locus of points of points of equal inclination (b) locus of points of points of equal thickness
(c) locus of points of points of equal inclination and equal thickness (d) none of these

(x)Bending of light rays round the corners of an obstacle is called
(a) diffraction (b) interference (c) polarisation (d) reflection

(xi) When one goes from central maximum to higher order of maximum in the diffraction pattern, then intensity
(a) increases (b) decreases (c) first increases and then decreases (d) none of these

(xii) In Fraunhofer diffraction, incident wavefront in general is
(a) spherical (b) cyiindrical (c) plane (d) ellipsoidal

(xiii) A light ray of wavelength λ is falling normally on a wedge shaped film of wedge angle (θ) and refractive index μ. The fringe width(β) in the interference pattern formed will be given by the expression
(a) $\beta = \lambda/2\mu\sin\theta$ (b) $\beta = \lambda\times2\mu\sin\theta$ (c) $\beta = \lambda\times2\mu\cos\theta$ (d) $\beta = \lambda/2\mu\cos\theta$

(xiv) The interference phenomena can take place
(a) in transverse waves only (b) in longitudinal waves only (c) in standing waves only (d) in all waves

(xv) A drop of oil is spread on a water surface, it displays beautiful colors in daylight because of
(a) reflection of light (b) dispersion of light (c) polarisation of light (d) interference of light

(xvi) A dark spot is obtained at the point of contact of plano convex lens and glass plate in case of Newton's rings in reflected because at this point path difference is
(a) $\lambda/2$ (b) λ (c) $5\lambda/2$ (d) 4λ

Section- B

5×2 = 10

Q.1 Two identical interfering beams of equal intensity have a phase difference of δ. Derive an expression for the intensity as a function of δ.

Q.2 The inclined faces of a prism ($\mu = 1.5$) make an angle of 1^0 with the base of the prism. The slit is 15 cm from the biprism and is illuminated by light of $\lambda = 5900$ Å. Find the fringe width at a distance of 1 m from the biprism.

Q.3 Light of wavelength 5893 Å is reflected at nearly normal incidence from a soap film of refractive index 1.42. What will be the least thickness that will appear (i) dark (ii) bright 2.5+2.5 = 5

Section- C

7×2=14

Q.1Explain the formation of interference fringes due to parallel thin film and derive the condition of bright and dark fringes in reflected light. Also write the condition of bright and dark fringes in the transmitted light for this film. 5+2=7

Q.2 Derive an expression for the diameter of dark Newton's rings in reflected light. 7

Q.3 Define the fringe width and coherent sources. In Young's double slit experiment the slits are 0.1 mm apart and the interference is observed on a screen placed at a distance of 200 cm from the slit. It is found that 9^{th} bright fringe is at a distance of 8.835 mm from the second dark fringe from the centre of pattern. Find the wavelength of light used. 1+1+5=7