

Modal Question Paper-1
B.Tech First Semester 2008- 2009
Subject – Physics-I

Time : 3 Hours

Max marks : 50

Note – The question paper contains Three sections A ,B and C with weightage of 10 , 15 and 25 marks respectively.

Section – A

Objective type questions:

(1x10 = 10)

Q. 1 An optical fibre is a transparent rod usually made of :

- (a) Clear plastic (b) Glass (c) copper (d) Either (a) & (b)

Q.2 Pulsed laser is :

- (a) Ruby laser (b) He-Ne laser (c) Dye laser (d) None of these

Q.3 The plane of vibration and plane of polarization are :

- (a) Perpendicular (b) Parallel (c) Inclined at 45^0 (d) None of these

Q.4 In Newton's rings arrangement in reflected light the center is

- (a) Bright (b) Dark (c) Coloured (d) can not say

Q.5 When interfering waves are polarized they must be

- (a) In different state of polarization (b) In the same state of polarization
(c) Interference is not possible (d) None of these

Q.6 The diffraction phenomenon was explained by

- (a) Newton (b) Fresnel (c) Young (d) Hertz

Q.7 The light used in biquartz polarimeter is

- (a) Red light (b) White light (c) Sodium light (d) Blue light

Q.8 The spectral lines in grating spectra are

- (a) Curved (b) Zig – Zag (c) Straight (d) None of these

Q.9 Nicol prism is made of

- (a) Glass (b) Quartz (c) Calcite (d) None of these

Q.10 In an optical fibre the propagation angle of light must be equal to or less than the

- (a) Acceptance angle (b) Incident angle (c) Critical angle (d) Refraction

Section – B

Short answer type questions : (Attempt any 5 questions)

(3x5 = 15)

Q.1 A particle of mass m_0 moves with speed $c/\sqrt{2}$. Calculate the mass, momentum, total energy and kinetic energy of the particle.

Q.2. Two particles come towards each other with speed $0.7C$ with respect to laboratory. What is their relative speed?

Q.3 What is the longest wavelength that can be observed in the fourth order for a diffraction grating having 5000 lines per c.m.

Q.4. Calculate the thickness of a quarter waveplate of Quartz for sodium light of wavelength 5893 \AA . The refractive index for Ordinary and Extra Ordinary rays are 1.54425 and 1.55336.

Q.5 A 200 mm long tube containing solution when placed in a sacrometer gives an optical rotation of 11° . If the specific rotation of sugar under the given experimental conditions is 66° , find the strength of the solution.

Q.6 Calculate the numerical aperture and hence the acceptance angle for an optical fibre given that refractive indices of the core and the cladding are 1.45 and 1.40 respectively.

Q.7 In Newton's rings experiment the diameters of the n^{th} and $(n + 14)^{\text{th}}$ rings are 4.2 mm and 7.0 mm respectively. Radius of curvature of plano – convex lens is 1 m. Calculate wavelength of light.

Section – C

Long answer type questions : Q 1 & 2 carry 9 marks. Other questions carry 8 marks each

Q.1 Explain the formation of Newton's ring in reflected monochromatic light. Derive an expression for the diameter of n^{th} dark and bright rings.

OR

Q.2 What is plane diffraction grating ? Discuss its theory and derive the condition of principle maxima and minima.

Q.3 Discuss briefly the Michelson –Morley experiment and mention the explanation of negative results.

OR

Q.4. Explain the phenomenon of double refraction in Calcite crystal. Describe the construction and working of Nicol prism.

Q.5 Explain the spontaneous and stimulated emission of radiation. Discuss the construction and working of a ruby laser.

OR

Q.6 Derive an expression for acceptance angle. Show its relation with numerical aperture.