SASTRA

SEEE

First CIA Test – Nov 2022

Class : B.Tech. – CSBS

Course Code: PHY 137

Course Name: FUNDAMENTALS OF PHYSICS

Duration: 90 minutes Max Marks: 50

Instructions to the candidates:

Draw neat diagrams wherever necessary. Figures to the right indicate full marks.

PART A

Answer ALL the questions: **(10 x 2 =20)**

1. Sketch a labelled graph showing both the potential energy and force of an undamped oscillator as a function of ~~time~~ distance
2. A bouncing ball returns to the same height each time. Is this an example of simple harmonic motion? Explain your answer.
3. A body of mass 36 g moves with SHM of amplitude A=13 cm and period T=12s. At t=0 x=+13 cm. Find the velocity when x=5 cm
4. If a yellow light with a wavelength of 540 nm shines on a double slit with the slits cut 0.0100 mm apart, determine what angle you should look away from the central fringe to see the second order fringe?
5. Explain why no interference bands are observed when light from two adjacent 60 W power of lamps in home fall on a screen.
6. For a diffraction grating experiment, what is the advantages of (a) many slits and (b) closely spaced slits?
7. Distinguish the phenomena of interference and diffraction
8. A diffraction grating produces a second-order spectrum of yellow light (λ = 550 nm) at 25°. Determine the spacing between the lines on the grating.
9. Three polarizing filters are stacked with the polarizing axes of the second and third filters oriented at 45° and 90°, respectively, relative to the polarizing axis of the first filter. Unpolarized light of intensity I_0 is incident on the first filter. Indicate variation of the intensity of light emerging from each filter

10. A Plane polarized light of wavelength 6000 A° is incident perpendicularly on a calcite plate of thickness 0.04 mm. Calculate the phase retardation that it will introduce between the e-ray and o-ray. Given that $\mu o = 1.642$ and $\mu e = 1.478$

PART B

Answer ALL the questions: (3 x 10 =30)

11. Discuss equation of motion of SHM to evaluate and sketch the displacement, velocity and acceleration.

12. Establish the relation between the radius of curvature and diameter of Newton rings. From the result, determine the wavelength of light of the unknown source.

13. A. Unpolarized light falls on two polarizing sheets placed on top of the other. What must be the angle between the characteristic directions of the sheets if the intensity of the transmitted light is one third of the incident beam? (4)

B. In Young's double slit experiment the slits are 0.5 mm apart and the interference is observed on a screen at a distance of 100 cm from the slit. It is found that the 9th bright fringe is at a distance of 7.5mm from the second dark fringe from the centre of the fringe pattern. Find the wavelength of the light used. (6)