

Exam. Code: 0905
Sub. Code: 6644

1128
B.E. (Bio-Technology)
First Semester
APH-101: Oscillations and Optics
(Common with IT and CSE)

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit. Calculator is allowed.

x-x-x

- I. Answer the following briefly:-
- If the frequency of wave is doubled, what change will occur in (i) its speed? (ii) its wavelength?
 - Briefly explain the reason why there is an angular limit for the extraordinary ray in Nicol Prism.
 - Why do thick films not show interference effects?
 - A light spectrum is formed on a screen using a diffraction grating. The entire apparatus (source, grating and screen) is now immersed in a liquid of refractive index 1.33. How the pattern on the screen is changed.
 - Why soldiers are in general ordered to walk out of step across a bridge? (5x2)

UNIT - I

- II. a) Show that the phase-space diagram (p_x versus x curve) of SHM is an ellipse with area equal to $\frac{E}{\nu}$ where E = total energy and ν = frequency of oscillations.
- b) Explain in detail the various applications of ultrasonic waves. (5,5)
- III. a) What is amplitude resonance? Derive the condition for amplitude resonance in case of forced oscillations.
- b) A damped oscillator, initially at rest, is suddenly set into motion at time $t = 0$. Its displacement is given by $x(t) = Ae^{-\gamma t/2} \cos(\omega t - \delta)$. Find δ in terms of γ and ω .
- IV. a) Two strings, of tension T and mass densities μ_1 and μ_2 are connected together. Consider a traveling wave incident on the boundary Find the ratio of the reflected amplitude to the incident amplitude, and the ratio of the transmitted amplitude to the incident amplitude.

P.T.O.

(2)

- b) Discuss the oscillatory discharge of a capacitor through a circuit containing an inductance and a resistance. When is the discharge oscillatory and what is the frequency of oscillation? (5,5)

UNIT - II

- V. a) In a double-slit experiment, the slits are 2 mm apart and are illuminated with a mixture of two wavelengths, $\lambda = 750 \text{ nm}$ and $\lambda' = 900 \text{ nm}$. At what minimum distance from the common central bright fringe on a screen 2 m from the slits will a bright fringe from one interference pattern coincide with a bright fringe from the other?
- b) Explain the construction of a quarter wave plate. How it can be used to differentiate between unpolarized and circularly polarized light.
- c) Differentiate between step index and graded index optical fibre. (3,5,2)
- VI. a) Explain in detail the various processes used in the working of Laser.
- b) Examine if two spectral lines of wavelengths: 5890 \AA and 5896 \AA can be clearly resolved in (i) the first order and (ii) the second order by a diffraction grating 2 cm wide and having 425 lines per cm. (5,5)
- VII. a) Describe the method of construction of hologram and reconstruction of image from it.
- b) Describe in detail an experiment to determine the wavelength of sodium light with Fresnel's biprism. (5,5)

x-x-x