

2123
B.E., First Semester
ASP-X01: Applied Physics
(Common with CSE, Bio-Tech, IT, ECE, Civil, EEE)

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Section.

x-x-x

Question I. Attempt any five parts of the following:

(2marks each)

- What is the physical significance of bandwidth of forced oscillator.
- Why are the interfacial angles altered in the construction of Nicol prism.
- Show that the average poynting vector associated with propagating electromagnetic wave is the sum of its electric and magnetic energy densities.
- How does graded index fiber aid in reducing modal dispersion.
- Give a distinctive feature between vector and phasor.
- Show that three level lasers always have spiking output.

SECTION A

Question II

- Show that $x=(A+Bt)e^{-pt}$ is the solution of critically damped oscillations. (3)
- State and prove Poynting vector theorem. Interpret each of the term in its result. (4)
- Show that the work done per second against the resistive or damping force is equal to the power supplied to the oscillator by the driving agency. (3)

Question III

- Discuss the propagation of EM waves in a conducting medium and discuss its important features. (4)
- Show that in a conductor the magnitude of electric vector reduces to about 1% at a distance of $0.73\lambda_c$, where λ_c is the wavelength of EM waves in the conductor. (2)
- A uniform rod of length L is nailed to a post such that two thirds of its length is below the nail. What is the time period of oscillations of the rod. (4)

P.T.O.

(2)

Question IV

- (a) Consider that an EM wave is incident at angle to the interface of two media. Using electromagnetic wave theory, prove the Snell's law of refraction. (4)
- (b) If ω is the angular frequency of the damped harmonic oscillator and ω_0 is the resonant frequency and $\omega^2 - \omega_0^2 = 10^{-6}\omega_0^2$, then find the Q-value and logarithmic decrement of the oscillator. (3)
- (c) Calculate the surface integral of a vector field $\vec{v} = 2xz\hat{i} + (x+2)\hat{j} + y(z^2-3)\hat{k}$ over five surfaces of a cube of side=2 and having one of its vertices at origin of coordinate system. Exclude the surface of cube lying in the xy plane of the coordinate system. (3)

SECTION B**Question V**

- (a) Discuss the construction and working of Nicol prism. Why are interfacial angles of calcite crystal reduced. (4)
- (b) Show that the four level laser is easiest to generate and sustain. (3)
- (c) Discuss the application of optical fiber as temperature sensor. (3)

Question VI

- (a) Give the construction and working of ruby laser. What are its drawbacks. (4)
- (b) Discuss the phenomenon of optical activity using wave theory of polarization. (3)
- (c) Discuss various kinds of attenuations suffered by the light signal propagating through the optical fiber. (3)

Question VII

- a) Discuss the construction of an optical fiber giving significance of each component. (3)
- b) Discuss sequentially the processes involved in the lasing action. (4)
- c) Discuss the working of an LCD display. (3)

x-x-x