VIBRATIONS AND WAVES - II

Paper-B : Semester-II

Time : Three Hours] [Maximum Marks : 30

Note : Attempt five question in all. Select two questions each from Section A and B. Question No. IX of Section-C is compulsory (attmept any questions from this section). Use of Non-programmable calculator is allowed.

SECTION-A

I. Discuss the exchange of energy between two stiffness coupled oscillations. (5)

II. (a) Derive an expression for the energy of a vibrating string. (3)

(b) Define Wave velocity and Group velocity. How they are related to each other in a dispersive medium ? (2)

III. Two LC circuits are inductively coupled. Discuss the behaviour of the coupled system and find the frequencies of oscillations. What is the effect on peak value of current if the coupling is weak or strong ? (5)

IV. (a) Two strings of linear densities 0.5 gm^{-1} and 2 gm^{-1} are joined together and stretched with a force of 50 N. Calculate the Coefficient of reflection and transmission of amplitude. (3)

(b) A wave of frequency 400 Hz is travelling with a speed of 800 ms^{-1} along x-axis. How far are two points situated whose displacements differ in phase by n/4 ? (2)

SECTION - B

V. Give physical interpretation of Maxwell's equation. Derive wave equation for electromagnetic waves in a conducting medium. (5)

VI. (a) Discuss the phenomenon of reflection of electromagnetic waves at a boundary for normal incidence. (3)

(b) Find numerically the velocity of electromagnetic waves in vacuum, ($\mu_0 = 4\pi \times 10^{-12}$ and $\varepsilon_0 = 8.85 \times 10^{-12}$ in SI units. (2)

VII. (a) Discuss the behaviour of a medium as conductor or insulator to electromagnetic waves. (3)

(b) Determine the impedance of a dielectric medium having $\varepsilon_r = 3$ and $\mu_r = 1$. (2)

VIII. State and derive Poyntings Theorem. (5)

SECTION-C
(Compulsory Question)

IX. Attempt any *five* questions :

(a) Find the coupling of a transformer in which self-inductance of primary is 0.28 H, self-inductance of secondary is 0.36 H and mutual inductance is 0.3 H.

(b) Do normal modes exchange energy with each other ? Comment.

(c) What do you mean by Nodes and Antinodes in a stationary wave ?

(d) What is Plane polarized electromagnetic wave ?

(e) The magnetic and electric fields are closely related to each other. Comment.

(f) Explain the difference between Progressive and Stationary waves.

(g) On what factor does the power of sinusoidal wave depend ? (5×2=10)