2055

B.E., Second Semester

ASP-X01: Applied Physics

(Common with ECE, EEE, MEC)

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt <u>five</u> 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 (2 x 5=10)

(a)   How do you understand reactance due to inertia and elasticity in the oscillations of a system.

(b)   Give the response of critically damped LC circuit oscillator to the external voltage.

(c)   All phenomena in wave optics are explicable by considering light solely as vibrations of electric field in space. Justify.

(d)   Write differential form of second Maxwell's second equation and draw inferences from it.

(e)   Is every crystal double refracting. Comment over this statement with justification.

(f)   Why is the output of ruby laser spiked.

(g)   Draw a neat and self-explaining block diagram of fiber-optic communication system.

SECTION A

Question II

(a)   What is Poynting vector and gives its significance. State Poynting vector theorem and express it in appropriate mathematical equation to interpretation of law of conservation of energy.   (6)

(b)   Show that in free simple harmonic oscillations, the average value of kinetic and potential energies, over a cycle of oscillation, are equal. What can be inferred from this fact.   (4)

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Question III

(a) Discuss various characteristics defining the quality of a damped harmonic oscillator. (5)

(b) Show that the maximum potential drop across the inductor in resonant LCR circuit is Q times the applied emf and it occurs at frequency $\omega = \dfrac{\omega_0}{\sqrt{1-\frac{1}{2Q^2}}}$ (5)

Question IV

(a) Using Bio-Savert law derive the expression for Ampere circuital rule. What were the inconsistency in this rule and how was it resolved to frame the more generalised Ampere-Maxwell law. (6)

(b) Derive Gauss' theorem from the Coulomb's law of electrostatics. Further justify why Gauss' law was preferred as first Maxwell equation. (4)

SECTION B

Question V

(a) What is the phenomenon of dichorism. Discuss different kinds of polaroids based on this phenomenon used to polarize light giving merits and demerits of each of them. (5)

(b) What is Kerr effect. Give one of its applications. (3)

(c) A beam of light has intensity of 196 SI units is incident on a clear transparent medium, with energy reflection coefficient as 0.25, at an angle of 60^0. Its reflected component suffers complete polarization. What is the intensity of the reflected beam of light and obtain the refractive index of the medium. (2)

Question VI

(a) Discuss sequentially various processes involved in the generation of laser. (5)

(b) Discuss the construction and working of a He-Ne laser. What are is merits and demerits. (5)

Question VII

(a) Discuss various kinds of attenuations suffered by light pulses while propagating through the optical fiber. On the basis of these attenuations justify three optical windows used in fibre-optic communications. (5)

(b) Discuss two applications of the optical fibre in the field of phase based sensors. (5)

x-x-x