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Total No. of Questions : 09] [Total No. of Pages : 03

B.Tech. (Sem. -1st/2nd)

ENGINEERING PHYSICS

SUBJECT CODE : PH - 101 (2k4 & Onwards)

Paper ID : [A0113]

[Note : Please fill subject code and paper ID on OMR]

Time : 03 Hours Maximum Marks : 60

Instruction to Candidates:

1) Section A is **compulsory**.
2) Attempt any **Five** questions from Section B & C.
3) Select at least **Two** questions from Section B & C.

## Section - A

**(Marks: 2 Each)**

*Q1)*

a) Which type of magnetic materials have permanent magnetic dipole moment associated to them?

b) What is Bohr-magneton?

c) Which laser gives output radiation having frequency in the visible as well as IR region?

d) What does permittivity of a medium signifies. State its value for free space.

e) Why a three level laser normally provide a pulsed output?

f) What do you understand by "10.5dB/Km@850nm"?

g) How you define proper length and proper time interval as per special theory of relativity?

h) Why n=0 state is not allowed for particle confined to an infinite potential box?

i) What is the physical significance attached to the conditions of continuity and single-valued nature of an acceptable wave function?

j) What is a Cooper pair?

## Section - B

**(Marks: 8 Each)**

*Q2)* (a) State and explain the Ampere's law and express it in differential form. Further explain how Maxwell modified this law to accept this as one of the Maxwell equations.

(b) The electrostatic potential in a certain space is given by $U = 3x + 4y - 6z$. Calculate the corresponding electric field strength (**E**).

*Q3)* (a) What are ferromagnetic domains? Explain their existence in terms of atomic dipole moments.

(b) How you distinguish between hard and soft magnetic materials.

(c) What do you mean by magnetostriction?

*Q4)* (a) Specify three types of possible transitions between two atomic energy levels and derive relations for the Einstein's coefficients.

(b) Calculate the ratio of transition rates of spontaneous emission to the stimulated emission for light of wavelength $10^{-6}$m and cavity temperature T=100K and hence determine which type of emission will dominate?

*Q5)* (a) Describe construction of an optical fiber with help of diagram. Further, describe different factors responsible for loss of signal propagating through a fiber.

(b) Calculate the numerical aperture, acceptance angle and the critical angle of a fiber having core and cladding refractive indices as 1.5 and 1.45, respectively.

## Section - C

**(Marks: 8 Each)**

*Q6)* (a) State and explain postulates of special theory of relativity with help of example.

(b) Define time dilation and derive the expression relating the time interval as observed in two inertial frames of references.

(c) Find total energy of an electron and a proton, both having momentum equal to 2 MeV/c.

*Q7)* (a) What is Moseley's law? Discuss its significance.

(b) Discuss origin of characteristic and continuous x-rays.

(c) The first maxima for Bragg's diffraction of x-rays from KC1 crystal (d = 0.314 nm) appears at 14°. Calculate energy of the incident x-rays.

*Q8)* (a) Establish time dependent Schrodinger wave equation and further deduce time independent form of this equation.

(b) What are the characteristics of a well behaved wave-function.

(c) Find the probability that a particle trapped in a box of width L can be found between 0.45L and 0.55L for ground state.

*Q9)* (a) Discuss the important differences between type-I and type-II superconductors with help of example and plots of magnetization (M) Vs magnetic field (H).

(b) What is Meissner effect? Further explain the effect of magnetic field on the superconducting state.

(c) Define London penetration depth and write its expression.