

Roll No. ....

Total No. of Questions : 09]

[Total No. of Pages : 03

**B.Tech. (Sem. -1<sup>st</sup>/2<sup>nd</sup>)****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?

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**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  $T=100$ K 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  $2 \text{ MeV}/c$ .

- 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 KCl crystal ( $d = 0.314$  nm) appears at  $14^\circ$ . 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.