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B.Tech. (Sem. - 1st)
ENGINEERING PHYSICS
SUBJECT CODE : PH - 101
Paper ID : [A0122]

[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) Selecting atleast Two questions from Section B & C.

Section - A

Q1)

(2 marks each)

- a) Define remanence and coercivity.
- b) Explain the term metastable state and its significance.
- c) Explain the term normalized frequency.
- d) Give examples of solenoidal and irrotational fields.
- e) What is the rest mass of photon.
- f) Why we X - rays only for crystal structure determination?
- g) How does the result of quantum mechanics differ from those of classical mechanics in harmonic oscillator.
- h) What is the difference between perfect diamagnet and superconductor?
- i) What effect does the target metal have on the continuous x - ray spectrum?
- j) What is the de - broglie concept of matter waves?

Section - B

(8 marks each)

- Q2) (a) Using Gauss's law of electrostatics, find the electric field due to a uniformly charged solid sphere at a point, which is lying outside the sphere.
- (b) In an electric field the electric potential is given by $U(x, y, z) = (4x^2 + 3y^2 + 9z^2)^{-1/2}$. Calculate the electric field at point (111).

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- Q3)** (a) Briefly describe the phenomenon of magnetic hysteresis and why it occurs for ferromagnetic and ferrimagnetic materials.
- (b) What is the difference between soft and hard magnetic materials.
- Q4)** (a) Explain the term following terms:
- (i) Population inversion.
- (ii) Semiconductor laser,
- (iii) Holography.
- (b) The light of wavelength 660 nm has a wave train of length 13.2×10^{-6} m. Calculate the coherent time.
- Q5)** (a) Find the core radius necessary for single mode operation at 820 nm of a step index fibre with $n_1 = 1.480$ and $n_2 = 1.478$.
- (b) Differentiate between material dispersion and pulse dispersion. Write down various types of losses in optical fibre.

Section - C

(8 marks each)

- Q6)** (a) An electron is moving with a speed of $0.9c$. Calculate its total energy and find the ratio of Newtonian kinetic energy to the relativistic kinetic energy.
- (b) Describe Michelson Morley experiment and show the negative results obtained from this experiment were interpreted.
- Q7)** (a) Calculate the wavelength of X - rays produced when the potential difference is 12400 volts.
- (b) Differentiate between characteristic and continuous X - rays. Give some industrial and engineering applications of X - rays.
- (c) What is Moseley's law? Give its applications.
- Q8)** (a) Derive an expression for the time independent Schrödinger wave equation.
- (b) An electron is bound by potential which closely approaches an infinite square well of width 2.5×10^{-10} m. Calculate the lowest three permissible quantum energies the electron can have.
- Q9)** (a) What do you understand by type - I and type - II superconductors? Explain with examples.
- (b) What are London equations? Find the expression for the penetration depth of a superconductor.

