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MAY 2011

Total No. of Questions : 09] [Total No. of Pages : 02

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).

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.