

Roll No.

DEC 2010

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) Selecting at least **Two** questions from Section - B & C.

Section - A

Q1) [Marks : 2 Each]

- a) What is the differential form of Gauss's law?
- b) What do you mean by ferromagnetic-domain?
- c) What is the fundamental principle of a hologram?
- d) What do you understand by Single mode and Multimode fibre?
- e) A stationary body explodes into two fragment each of rest mass 1 Kg that move apart at speeds of $0.6c$ relative to the original body. Find the mass of the original body.
- f) Two photons approach each other, what is their relative velocity.
- g) An X-ray tube is operated at 25 kV. Find the minimum wavelength of X-rays emitted from it.
- h) What is de-Broglie hypothesis?
- i) What is Compton effect?
- j) What is Meissner effect?

Section - B

[Marks : 8 Each]

- Q2) (a) Write down Maxwell's equations and explain their physical significance.
(b) Show that the velocity of plane electromagnetic wave in free space is

given by
$$c = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$$

- Q3) (a) What are ferrites? How are they superior to ferromagnetic materials?
(b) Write a short note on magnetostriction.
(c) Define magnetic susceptibility & relative magnetic permeability and establish the relationship between them.

- Q4) (a) Discuss with suitable diagrams the principle, construction and working of Helium-Neon Laser. Explain the role of Helium atoms in this laser. How is it superior to a Ruby-laser?
(b) What are the differences between the terms spontaneous and stimulated emission?

- Q5) (a) Explain the difference between a step-index fibre and graded index fibre.
(b) What is meant by acceptance angle for an optical fibre? Show how it is related to numerical aperture.

Section - C

[Marks : 8 Each]

- Q6) (a) What was the objective of conducting the Michelson-Morley experiment? Describe the experiment. How is the negative result of the experiment interpreted?

(b) Show that the rest mass of a particle is given by
$$m_0 = \frac{p^2 c^2 - T^2}{2Tc^2}$$
 where

p and T denote the momentum and kinetic energy of the particle.

- Q7)** (a) What is Moseley's law? How can it be explained on the basis of Bohr's theory? What is its importance?
- (b) How will it affect the cut off wavelength of X-rays if the separation between the cathode and target is doubled?
- Q8)** (a) What is Born's probability interpretation of wave-function?
- (b) What is the difference between phase and group velocities? Show that the de Broglie group velocity associated with the wave packet is equal to the velocity of the particle.
- Q9)** (a) Explain the difference between the Type I and Type II superconductors.
- (b) Give the salient features of BCS theory of superconductors.
- (c) Superconductors are a perfect diamagnet. Explain.

