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**B.Tech. (Sem. - 2<sup>nd</sup>)**  
**ENGG. PHYSICS**  
**SUBJECT CODE : PH - 101**  
**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) The speed of storing and reading out information from a computer core is less than a microsecond. Why it is necessary to use ferrite for this application?
- b) Define spontaneous and stimulated emission.
- c) Explain the term mode related to optical fibre.
- d) Write the Maxwell equations in differential form.
- e) Dose photon have mass? If no, then how photons have momentum?
- f) What is the significance of Bragg's law?
- g) What is the significance of wave function?
- h) What are the conditions for a material to be a superconductor?
- i) How does x-rays differ from gamma rays?
- j) What is the importance of uncertainty principle?

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### Section - B

(Marks : 8 each)

- Q2)** a) Write down maxwell equations and explain their significance.  
b) A solenoid is 1 m long and 3 cm in diameter. It has five layers of windings of 850 turns each and carries a current of 5 A. What is B at its centre.
- Q3)** a) Explain the term following terms : (i) magnetic anisotropy, (ii) magnetostriction, (iii) magnetic domains.  
b) What are ferrite materials? Give some of its useful applications.
- Q4)** a) Differentiate between three level and four level lasers. Give the construction and working of He-Ne laser.  
b) What is holography?
- Q5)** a) A fibre is made with core of refractive index 1.5 and the cladding is doped to give a refractive index difference of a 0.0005. Find (i) the cladding refractive index, (ii) the critical angle, (iii) acceptance angle and (iv) numerical aperture.  
b) Describe the role of fiber connectors, splicers and couplers in communication through optical fibers.

### Section - C

(Marks : 8 each)

- Q6)** a) Calculate the mass and velocity of an electron having a total energy of 2MeV.  
b) State the fundamental postulates of special theory of relativity and hence deduce the lorentz transformation.
- Q7)** a) What thickness of lead will attenuate a beam of 0.4 MeV x-rays by a factor of 2? Given :  $\mu = 2.3/\text{cm}$ .  
b) Why x-rays are preferred for crystal structure determination? Derive an expression for Bragg's law. How Bragg's law is used in crystallography?
- Q8)** a) Derive an expression for the time dependent schrodinger wave equation.  
b) What is the energy of gamma ray having a wavelength of  $1 \text{ \AA}$
- Q9)** a) Explain BCS theory of superconductivity.  
b) What are London equations? Find the expression for the penetration depth of a superconductor.

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