**MOTIHARI COLLEGE OF ENGINEERING, MOTIHARI**

**B. Tech 1st Year (EEE+CSE)**

**Question Bank**

1. **SECTION A**

a) What is the physical significance of curl of a vector field?

b) State Poynting theorem and interpret each term in its expression.

c) What is the atomic origin of Para magnetism exhibited by certain materials?

d) What are the essential conditions for a unit cell to be called a primitive cell?

e) What is population inversion and give its significance in lasing action?

f) How does light propagate through an optical fiber?

g) Give basic postulates of special theory of relativity.

h) Justify why an electron can't be accelerated in a cyclotron. i) List properties of a well behaved wave functions for a given system. j) Give a brief and broad outline of synthesis of nanomaterials through chemical vapors deposition.

1. **SECTION-B**

a) Derive the equations of electromagnetic waves propagation through free space. Further deduce important properties of EM wave propagation in free space.

b) What is Ampere's circuital rule? What is the drawback of this rule and how it was accounted for by Maxwell?

c) Describe how ultrasonic waves are generated using the method of magnetostriction.

d) What are type I and type II superconductors and give their distinguishing features.

e) What is Bragg's law. Derive the Bragg’s condition for x-ray diffraction. What are the limitations of Bragg's law?

f) A certain orthorhombic crystal has a ratio of a : b : c of 0.428:1:0.376. Find Miller indices of the faces with intercepts 0.214:1:0.188. 3 5.

g) Discuss the construction and working of a Semiconductor laser.

h) Give a qualitative idea of formation and reconstruction of hologram.

1. **SECTION-C**

a) What are different kinds of optical fibers? How is light wave guided through an optical fiber? Derive and interpret the numerical aperture of an optical fiber.

b) Give various kinds of dispersion suffered by the light wave while propagating through an optical fiber.

c) How is Heisenberg's uncertainty principle a natural consequence wave nature of moving particles?

d) Consider a particle of mass m trapped in an one dimensional box of infinite depth. Using steady state Schrodinger's equation obtain permissible states and corresponding energies of the particle.

e) Derive the expression for variation of mass of a relativistic body with velocity.

f) The mean life of a muon, when it is at rest, is 2.2μs. Calculate the average distance it will travel in vacuum before it decays, if it has velocity of 0.9c.

g) Discuss sol-gel technique for synthesis of nanomaterials.

h) Write a short note on properties of nanomaterials which distinguish it from bulk matter

1. **SECTION-D**

a) Differentiate between dielectrics and conductors by taking suitable example(s).

b) Define Poynting vector.

c) Suggest some method to detect Ultrasonic waves

d) What is meant by stimulated emission?

e) What is meant by space lattice? f) What do you mean by pulse broadening?

f) What is the outcome of Michelson Morley Experiment?

g) Where do we use Lorentz transformations, and why. i) What do you understand by

Eigen functions. j) Explain electron confinement.

1. **SECTION E**

a) What do you understand by displacement current . Suggest a method to calculate it.

b) Solve Maxwell's equations in time varying fields.

c) A magnetizing field of 1400 Am-1 produces a magnetic flux of 3x10-5 weber in an

iron bar of cross sectional area 0.3 cm2. Calculate permeability and susceptibility of the

bar.

d) What do you understand by ferrites? Discuss their main applications. A. Find the

maximum frequency present in the radiation from an X-ray tube whose accelerating

potential is 5x104 V. B. Discuss working principle and construction of Braggs

spectrometer.

e) Using appropriate energy level diagram, discuss the working of He-Ne laser.

f) Discuss relevance of Einstein's coefficients in context of Lasing mechanism.

1. **SECTION F**
2. A glass fiber has a core material of refractive index 1.50 and cladding material of refractive index 1.45. If it is surrounded by air, compute the critical angle (i) at core-cladding boundary and (ii) at cladding -air boundary.

b) Discuss merits and demerits of multi-mode optical fibres.

c) The mass of a moving electron is 8 times its rest mass. Find its kinetic energy and

momentum.

d) What do you understand by simultaneity in relativity.

e) Derive time independent Schrodinger wave equation and discuss its significance in

today's context.

f) What is the significance of quantum mechanics for macroscopic bodies.

g) Explain the concept of Super-Para magnetism in view of Nano synthesis.

h) Discuss some important application(s) of Nano particles