Roll No.

**Total No. of Pages: 02**
**Total No. of Questions: 09**

**B.TECH (Sem.-1ˢᵗ & 2ⁿᵈ)**
# ENGINEERING PHYSICS
**Subject Code: BTPH-101**
**Paper ID: [A1102]**

**Time: 3 Hrs.** **Max. Marks: 60**

**INSTRUCTIONS TO CANDIDATE:**
*(i) Question 1 is compulsory.*
*(ii) Attempt five questions from part A and part B with two questions from each part A and part B*

(10x2=20)

Q1. (a) What is the physical significance of gradient of a scalar field?

(b) What information does the quantity poynting vector furnish?

(c) What is the atomic origin of diamagnetism exhibited by certain materials?

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

(e) Differentiate between spontaneous and stimulated emissions.

(f) What is the basic principle of guiding the light wave through an optical fibre.

(g) What were the conclusions of Michelson-Morley experiment?

(h) Justify why a photon can't be brought to rest in any frame of reference.

(i) What are the essential requisites for a well behaved wave functions for a given system?

(j) Give a brief and broad outline of sol-gel synthesis of nanomaterials.

## Part-A

Q2. (4,4)

(a) State and prove Poynting vector theorem. Give significance of each term.

(b) Discuss various kinds of polarizations induced in the dielectric when it is subjected to external electric field.

Q3. (4,4)

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

(b) Give a brief account of occurrence of superconductivity using BCS theory.

Q 4. (5,3)

(a) How are x-rays produced. Further discuss the origin of characteristic and continuous x-rays.

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(b) 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.

Q5. (4,4)

(a) Discuss the construction and working of a ruby laser.

(b) Give a qualitative idea of formation and reconstruction of hologram.

## PART B

Q6. (5,3)

(a) What are different kinds of optical fibers. Discuss various kinds of dispersions observed when light propagates through an optical fiber.

(b) Give three applications of optical fibres.

Q7. (4,4)

(a) Show that Heisenberg's uncertainty principle is a natural consequence wave nature associated with moving material particles.

(b) Obtain time independent Schrodinger's equation. Argue qualitatively that energy quantization is embedded in this equation.

Q8. (5,3)

(a) Derive the expression for length contraction.

(b) 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.

Q9. (5,3)

(a) Discuss various techniques for synthesis of nanomaterials.

(b) Write a short note on carbon nanotubes.

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