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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.

- (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 $2.2\mu\text{s}$. 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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