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Total No. of Pages : 02

Total No. of Questions : 09

**B.Tech. (2011 Onwards) (Sem.–1,2)**

**ENGINEERING PHYSICS**

**Subject Code : BTPH-101**

**Paper ID : [A1102]**

**Time : 3 Hrs.**

**Max. Marks : 60**

**INSTRUCTION TO CANDIDATES :**

1. **SECTION-A is COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION - B & C. have FOUR** questions each.
3. **Attempt any FIVE** questions from **SECTION B & C** carrying **EIGHT** marks each.
4. **Select atleast TWO** questions from **SECTION - B & C.**

**SECTION-A**

**1. Write briefly :**

- 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 paramagnetism 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 vapour deposition.

## SECTION-B

2. a) Derive the equations of electromagnetic waves propagation through free space. Further deduce important properties of EM wave propagation in free space. 5  
b) What is Ampere's circuital rule? What is the drawback of this rule and how it was accounted for by Maxwell? 3
3. a) Describe how ultrasonic waves are generated using the method of magnetostriction. 5  
b) What are type I and type II superconductors and give their distinguishing features. 3
4. a) What is Bragg's law. Derive the Bragg's condition for x-ray diffraction. What are the limitations of Bragg's law? 5  
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. 3
5. a) Discuss the construction and working of a Semiconductor laser. 4  
b) Give a qualitative idea of formation and reconstruction of hologram. 4

## SECTION-C

6. 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. 5  
b) Give various kinds of dispersion suffered by the light wave while propagating through an optical fiber. 3
7. a) How is Heisenberg's uncertainty principle a natural consequence wave nature of moving particles? 4  
b) 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. 4
8. a) Derive the expression for variation of mass of a relativistic body with velocity. 5  
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  $0.9c$ . 3
9. a) Discuss sol-gel technique for synthesis of nanomaterials. 5  
b) Write a short note on properties of nanomaterials which distinguish it from bulk matter. 3