Roll No. | | | | | | | | | | | | **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 divergence of a vector field?

(b) Show that divergence of curl of a vector field always vanishes.

(c) What is isotope effect?

(d) Distinguish between the origin of characteristic and continuous x-rays.

(e) Discuss various pumping methods used in lasers for obtaining the state of population inversion.

(f) What are various signal attenuation and losses in an optical fiber?

(g) What are space-like and time-like intervals in relativity?

(h) Using energy-time uncertainty principle, show that no excited state in atom can be mono-energetic in nature.

(i) Why a particle trapped in a box can't be at rest?

(j) Define Nanoscience and Nanotechnology.

SECTION-B

2. (a) What is Poynting vector and give its significance? State and prove Poynting vector theorem.

   (b) Write differential form of Maxwell's equations applicable in material medium. (6, 2)

3. (a) Discuss the origin of Dia-, para- and ferro-magnetism on atomic basis.

   (b) Give a brief account of BCS theory of superconductivity. (5, 3)

4. (a) Discuss the shape of diamond unit cell and derive its atomic packing fraction.

   (b) A diffraction pattern of a cubic crystal structure of lattice parameter 3.16Å is obtained with monochromatic X-ray beam of wavelength 1.54Å. The first line on this pattern was observed at 20.3°. Determine the inter-planer spacing and Miller's indices of the reflecting plane. (5, 3)

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

   (b) Give distinguishing features of holography from the conventional photography. (4, 4)

SECTION-C

6. (a) What is an optical fiber? Give the basic principle of light guidance through the optical fiber. Derive an expression for numerical aperture of an optical fiber.

   (b) What are Splices and Couplers? (6, 2)

7. (a) What is the matter wave associated with moving particle? Derive expression for phase and group velocities of such a wave packet.

   (b) Give a brief account of need and origin of quantum mechanics. (4, 4)

8. (a) Discuss the Michelson-Morley experiment and give its conclusions.

   (b) What is the length of the metre stick moving parallel to its length when its mass is 1.5 times its rest mass? (6, 2)

9. (a) Discuss various techniques for synthesis of nanomaterials.

   (b) Write a short note on carbon nanotubes. (5, 3)