[Total No. of Questions - 9] [Total No. of Printed Pages - 3]

Dec.-23-1205

PHY-111 (Applied Physics) (Group-A)

B.Tech. 1st (CBCS/NEP)

(Common for all Branches)

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

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt Five questions in all, selecting one question each from section A, B, C and D. Section E is Compulsory.

SECTION - A

1. (a) What are Einstein coefficients? Derive Einstein relation. (5)

   (b) Explain with the help of suitable diagram the principle, construction and working of He-Ne laser. (5)

2. (a) Deduce Einstein's mass- energy relation $E = mc^2$. Give some evidence showing its validity. (5)

   (b) Explain time dilation and length contraction. (5)

SECTION - B

3. (a) Obtain expression for energy of a simple harmonic oscillator and show that total energy of oscillator remains constant. (5)

   (b) A particle executes S.H.M. motion of period 31.4 seconds and amplitude 5 cm. Calculate its maximum velocity and maximum acceleration. (5)

4. (a) Explain basic structure of an optical fiber with suitable diagram. Explain function of each block. (5)

   (b) What are various modes of an optical fiber? Give their importance and applications. (5)

SECTION - C

5. (a) Discuss uncertainty principle. How does it explain the absence of electrons inside the nucleus? (5)

   (b) Define group velocity and phase velocity. Obtain relation between them. (5)

6. (a) What are X-rays? Explain the production and properties of X-rays. (5)

   (b) An X-ray tube operates on 80 V. Find the maximum speed of electron with which it strikes the target. (5)

SECTION - D

7. (a) Using Maxwell's equations, obtain electromagnetic wave equation in vacuum. (6)

   (b) What is displacement current? Obtain expression for it. (4)

8. (a) What is superconductivity? Discuss BCS theory of superconductivity. (6)

   (b) Distinguish between type I and type II superconductors. (4)

SECTION - E (Compulsory)

9. (a) Why wave nature of matter is not apparent in our daily life observations?

   (b) What are Bremsstrahlung radiations?

   (c) Why should wave function be single valued everywhere?

[P.T.O.]

(d) Define Poynting vector. What are its units?

(e) Why light waves travel through vacuum, whereas sound waves cannot?

(f) Explain whether earth is inertial or non-inertial frame of reference.

(g) What is transition temperature in superconductivity?

(h) Explain single mode and multi-mode fibers?

(i) At what displacement from mean position, the total energy of a particle is half kinetic Energy and half potential energy.

(j) What do you mean by inductive coupling? (10×2=20)