

- (b) How will you differentiate between type I and type II superconductors ? 7.5

(Compulsory Question)

9. (a) At what speed does the kinetic energy of a particle equal to its rest mass energy ?
- (b) How is laser light different from an ordinary source of light ?
- (c) Why optical fibre communication systems are preferred over conventional communication systems ?
- (d) What do you mean by sharpness of resonance ?
- (e) Explain, how the X-ray are produced.
- (f) Find the lowest energy of an electron confined to move in a one-dimensional box of length 5 Å. Express the result in electron volts.
- (g) State the properties of EM wave travelling in free space.
- (h) Explain the term 'magnetic levitation.'
- (i) Write the relation between group velocity and phase velocity for dispersive wave and non-dispersive wave.
- (j) Write application of lasers in science and industry (*two* for each). 1.5×10=15

Sep-21-00003

B. Tech. EXAMINATION, 2021

Semester I (CBCS)

ENGINEERING PHYSICS

PH-101

Time : 2 Hours

Maximum Marks : 60

The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.

Note : Attempt *Four* questions in all, selecting *one* question from any of the Sections A, B, C and D.
Q. No. 9 is compulsory.

Section A

1. (a) State the postulates of special theory of relativity and derive the Lorentz transformation equations. 7.5

(b) Calculate the percentage contraction of a rod moving with a velocity of $0.8c$ in a direction inclined at 60° to its own length. 7.5

2. (a) Explain the essential requirement for production of laser action. How could probability of stimulated emission be increased? 7.5

(b) Describe the construction and working of a solid state Ruby laser using energy level diagram. 7.5

Section B

3. (a) Derive an expression for the total energy of a particle executing simple harmonic motion. 7.5

(b) If the relaxation time of a damped harmonic oscillator is 50 second, find the time in which the amplitude and energy of the system falls to $1/e$ times the initial value. 7.5

4. (a) Derive an expression for the maximum acceptance angle and numerical aperture of an optical fiber. 7.5

(b) Write a note on attenuation and losses in optical fiber. 7.5

Section C

5. (a) Derive Schrödinger's time dependent wave equation. What is the physical significance of wave function used in this equation? 7.5

(b) Using uncertainty principle, explain why an electron cannot exist within the nucleus. 7.5

6. (a) An electron with energy 20 eV is incident on a barrier of height 30 eV. What is the probability that the electron will tunnel through the barrier if its width is 1.0 nm? 7.5

(b) Distinguish between continuous and characteristics X-rays. 7.5

Section D

7. (a) Derive the Maxwell's equation. Discuss their physical significance. 7.5

(b) What do you mean by boundary conditions? Derive the boundary conditions of electric and magnetic field at the interface of two media. 7.5

8. (a) Derive the London's equation for superconductors. 7.5