

101+4 = 105

SBS STATE TECHNICAL CAMPUS, NH-05, FIROZPUR
B.Tech. 1st/2nd Sem. (All Disciplines)

ENGINEERING PHYSICS (BTPH-101) | BTPH 101A

Time Allowed: 3hrs.

Max. Marks - 60

IMPORTANT

1. This question paper has 02 Sections; A & B.
2. All questions are compulsory.
3. Section A has only 01 question i.e. Q. 1 and Section B has 05 questions with internal choice.
4. Distribution of marks and related Course Objective (CO) are given against each question in brackets.

SECTION A:

Question 1:

20 Marks (10x2)

- (a) What is electric charge? How is it distributed on objects?
- (b) Differentiate between Spontaneous and Stimulated Emissions.
- (c) What are electromagnetic waves? How are these different from mechanical waves?
- (d) What is the relationship among P, E and D vectors.
- (e) Explain Spontaneous & Stimulated Emissions in reference to Lasers.
- (f) What are the important findings of Michelson Morley experiment?
- (g) What is Mosley's Law in reference to X-Rays?
- (h) The matter waves can have velocity larger than velocity of light, Explain.
- (i) What is Critical Current Density in reference to Superconductors?
- (j) How Nano-materials are different from normal polycrystalline materials.

SECTION B:

Question 2:

8 Marks, CO-2

(a) What are electromagnetic waves? What are Maxwell's Equations? Write down Maxwell's Equations for free space and thus derive the general equation for Electromagnetic Waves. Explain the concept and physical significance of Poynting Vector.

OR

(b) What are Nano-materials? Why do they have properties different from bulk materials? What are the major strategies to synthesize and process them, explain by giving the example of Carbon Nano-tubes.

Question 3:

8 Marks, CO-1

(a) What do you understand by Space Lattice? How one can get structure from it? Explain the concept of Miller Indices? Describe the method of determining Miller Indices of planes and directions.

OR

(b) Explain the origin of Magnetism in materials. What is Bohr Magnetron? Explain Ferromagnetism. What is internal field and thus derive the Curie Weiss Law? What are Ferrimagnetic Materials? How are they different from Ferro and Antiferromagnetic materials?

Question 4:

8 Marks, CO-4

(a) Explain Spontaneous & Stimulated Emissions in reference to Lasers. What are the components of a typical Laser System? Explain the working, principle and structure of Carbon Dioxide Laser with neat diagram.

OR

(b) What are X-rays? How are these produced? Distinguish between Characteristic and Continuous X-rays. How are X-Rays used in Non-destructive Testing i.e. X-Ray Diffraction by crystals.

Question 5:

8 Marks, CO-3

(a) How do we achieve the guided propagation of light in Optical Fibres? Explain Step Index and Graded Index optical fibres. A step index optical fibre has the refractive indices of 1.5 and 1.41 of core and cladding respectively. Find out the values of Acceptance Angle, Numerical Aperture, Fractional Refractive Index Change and Acceptance Cone Angle.

OR

(b) What do you understand by Superconductivity? Differentiate between Type I & Type II superconductors. What are Cooper Pairs? How are these formed? Explain the BCS Theory of Superconductivity.

Question 6:

8 Marks, CO-5

(a) Explain the Lorentz Transformations of Space and Time in reference to the Special Theory of Relativity? Deduce the expression for Time dilation using Lorentz Transformations.

OR

(b) What do you understand by a Wave Function? Explain its normalization with physical significance. Derive the time dependent Schrodinger Equation using the concept of Energy and momentum operators.