BSc. Semester -VI

(CBCS)

Physics Theory

Course code: UPHTC601   **M. Marks: 80**

Duration - 3Hrs

Note: - Candidate has to attempt all the questions from section A and section B and two questions from section C.

Section A
(Short answer type)

1. Find the Miller indices of a plane which makes the intercepts a, 2a, 3a in a simple

   cubic unit cell.   **(3 marks)**

2. What are phonons? How are they different from photons?   **(3 marks)**

3. Define diamagnetic and paramagnetic materials?   **(3 marks)**

4. Discuss the phenomenon of Raman Effect?   **(3 marks)**

5. Discuss attenuation of light in an optical medium?   **(3 marks)**

Section B
(Medium answer type)

6. What is Reciprocal lattice? What are the steps to find reciprocal lattice vectors

   of a given plane?   **(7 marks)**

7. Derive dispersion relation for the mono atomic linear lattice?   **(7 marks)**

8. Explain Langevin's theory for diamagnetic materials?   **(7 marks)**

9. Explain phenomenon of fluorescence and phosphorescence on the basis

   of Energy Band theory of solids?   **(7 marks)**

10. What do you understand by optical resonant cavity? Give its construction
    and working principle.   (7 marks)

Section C
(Long answer type)

11. (a) Derive Laue's equations and hence deduce Bragg's law from these
      equations?   (12 Marks)

   (b) The spacing between the planes of Nacl crystal is 2.82×10^{-10} m. The first
      order Bragg's reflection occurs at an angle of $30°$. Find the wavelength of
      X-rays?   (3 marks)

12. What is superconductivity and its properties? Discuss how Meissner effect
    helps in classifying different types of superconductors?   (15 Marks)

13. Explain the Curie's Law for Paramagnetic substances? Derive it on the basis
    of quantum mechanics?   (15 Marks)

14. (a) Derive the formula for acceptance angle and numerical aperture for a
     given optical fibre. How you can classify optical fibres?   (12 Marks)

   (b) Calculate the critical angle and acceptance angle of an optical fibre with
        refractive index 1.6 and 1.3 of core and cladding?   (3 Marks)

15. Based upon Einstein' prediction, Derive expression for the Einstein's relations.
    What is the significance of these relations?   (15 Marks)