

21U607

(Pages: 2)

Name: .....

Reg.No: .....

**SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2024**

(CBCSS - UG)

(Regular/Supplementary/Improvement)

**CC19U PHY6 B11 / CC20U PHY6 B11 - STATISTICAL PHYSICS, SOLID STATE PHYSICS,  
SPECTROSCOPY AND PHOTONICS**

(Physics - Core Course)

(2019 Admission onwards)

Time : 2.00 Hours

Maximum : 60 Marks

Credit : 3

**Part A** (Short answer questions)

Answer *all* questions. Each question carries 2 marks.

1. What does BE statistics deal with?
2. What is Fermi-Dirac Distribution?
3. How would you generate a crystal structure from lattice and basis?
4. Define (i) point group symmetry and (ii) space group symmetry.
5. What is meant by Miller indices? What is their importance?
6. How is the intensity of spectral lines related to population of state?
7. Distinguish between prolate and oblate molecules.
8. Explain the diatomic molecule as a simple harmonic oscillator model.
9. What are hot bands? Why are they called so?
10. Explain spontaneous emission. What are the factors on which it depends?
11. What are the conditions to be satisfied to have large stimulated emission?
12. What is an active medium?

**(Ceiling: 20 Marks)**

**Part B** (Short essay questions - Paragraph)

Answer *all* questions. Each question carries 5 marks.

13. A system contains 10 electrons. Calculate the total number of microstates possible.
14. Explain the experimental determination of molecular speeds.
15. Obtain an expression for the packing fraction of hcp structure.

16. Derive Bragg's law. Derive an expression for the interplanar distance.
17. Give the different purposes of slits in a spectrometer.
18. How is population inversion achieved in semiconductor lasers?
19. Explain the quantum theory of Raman effect.

**(Ceiling: 30 Marks)**

**Part C (Essay questions)**

Answer any *one* question. The question carries 10 marks.

20. What is F-D statistics? Derive an expression for Fermi-Dirac distribution law of electrons.
21. Discuss the theory of rotation-vibration spectrum of a diatomic molecule.

**(1 × 10 = 10 Marks)**

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