D6BPH2102 | | Reg.No.....

Name: .....

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2024

(Regular/Improvement/Supplementary)

PHYSICS

GPHY6B11T: STATISTICAL PHYSICS, SOLID STATE PHYSICS, SPECTROSCOPY & PHOTONICS

Time: 2 Hours **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries *two* marks.
(Ceiling 20 Marks)

1. What are the key differences between classical and quantum statistics?
2. Distinguish between a unit cell and a primitive cell.
3. Explain the concept of Bravais lattices.
4. Explain resolving power of a spectrometer.
5. What are hot bands?
6. What is the difference between spontaneous emission and stimulated emission?
7. What are the different radiations in electromagnetic spectrum?
8. What is Morse curve?
9. Give any two applications of lasers.
10. Mention any two applications of Bose–Einstein statistics.
11. Explain the concept of Crystal symmetry. What is its importance in solid state physics?
12. What are the basic elements of practical spectrometer?

SECTION B: Answer the following questions. Each carries *five* marks.

(Ceiling 30 Marks)

13. Explain the working of a He- Ne Laser with suitable diagrams.
14. Explain the spectrum of a rigid rotator.
15. Discuss Einstein's coefficients in the context of stimulated emission.
16. What will be the change observed in the spectrum of a molecule when the molecule is considered as a simple harmonic oscillator and anharmonic oscillator? Why?
17. What are the factors affecting intensities of spectra lines?
18. Obtain the Miller indices of a plane with intercepts at 3a, (b / 2) and c in a simple cubic unit cell. Draw the plane.
19. A container holds one mole of argon gas at a temperature of 300 K. Calculate the fraction of the molecules in the container with energies between 0.025 eV and 0.026 eV.

SECTION C: Answer any *one* question. Each carries *ten* marks.

20. Derive and explain Bragg's law. Explain the working of a Bragg's X-ray spectrometer.
21. Compare Maxwell–Boltzmann, Fermi-Dirac and Bose–Einstein statistics. Give examples of particles obeying each of the above.

(1 x 10 = 10 Marks)