D5BPH2302 **Reg. No.............................**

Name: ....

FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2025

(Regular/Improvement/Supplementary)

PHYSICS

GPHY5B07T: QUANTUM MECHANICS

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

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

1. What is fine structure effect?
2. Explain the term degeneracy of eigen states.
3. Give two drawbacks of Bohr's atom model.
4. What is Bohr magneton? What is its value?
5. Distinguish between free and confined particle.
6. What is meant by normalized wavefunction?
7. Explain how amplitude of a de Broglie wave related to the probability of finding the particle.
8. What is the physical significance of orbital quantum number?
9. What is a wave packet?
10. Write down the Balmer formula and explain the terms involved.
11. What do you mean by potential energy step?
12. What is meant by space quantisation of angular momentum?

SECTION B: Answer the following questions. Each carries *five* marks. (Ceiling 30 marks)

13. Explain the problem of quantum mechanical tunneling. Discuss with an example.
14. Give an account on Ultraviolet catastrophe.
15. Explain Davisson and Germer experiment with proper diagram.
16. A sample of certain element is placed in a 0.30 Tesla magnetic field and suitably excited. How far apart are the Zeeman components of the 450 nm spectral line of this element?
17. An electron moves in x-direction with a speed of 3.6×10^6 m/s. We can measure its speed with the precision of 1%. With what precision can we simultaneously measure its position?
18. X-rays of wavelength 5 pm are Compton scattered from a target. Determine the minimum and maximum wavelength of the scattered x-rays.
19. State and prove correspondence principle.

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

20. Solve the problem of quantum harmonic oscillator by using Schrodinger equation.
21. What is photoelectric effect? Give quantum mechanical explanation of photoelectric effect and hence obtain the Einstein equation for it.

(1 × 10 = 10 Marks)