

Enrollment No: _____

Exam Seat No: _____

C.U.SHAH UNIVERSITY

Summer Examination-2019

Subject Name: Quantum Mechanics**Subject Code: 4SC06QUM1****Branch: B.Sc. (Physics)****Semester: 6****Date: 16/04/2019****Time: 10:30 To 01:30****Marks: 70**

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

Q-1	Attempt the following questions:	(14)
	a) What do you mean by a Wavefunction?	1
	b) Differentiate: Symmetric and Asymmetric Wavefunction	1
	c) State the Pauli's Exclusion Principle.	1
	d) Write the main difference between Normal Zeeman and Anomalous Zeeman Effect.	1
	e) Give the expectation value for position in Quantum Mechanics.	1
	f) What are quantum numbers?	1
	g) List two conditions for an acceptable Wavefunction.	1
	h) Define the term Probability density in Quantum Mechanics.	1
	i) Draw the vectorial diagram for j-j coupling scheme.	1
	j) Define the term Stationary State used in Quantum Mechanics.	1
	k) What does Spin- Orbit Interaction mean?	1
	l) Give the expression for Bohr Magneton.	1
	m) Define Gyromagnetic Ratio.	1
	n) Write the general normalization condition for a wavefunction.	1

Attempt any four questions from Q-2 to Q-8

Q-2	Attempt all questions	(14)
	a) Write a note on Wavefunction and its properties	6
	b) Using the idea of Wave Mechanics derive TDSE	8
Q-3	Attempt all questions	(14)
	a) Explain in detail the operators in Quantum Mechanics	8
	b) Give the necessary points for a wavefunction to be acceptable.	6
Q-4	Attempt all questions	(14)
	a) Derive Time Independent Schrödinger equation using Helmholtz's wave equation.	7
	b) Give an account on Wavefunction for a free particle	7
Q-5	Attempt all questions	(14)
	a) Explain in detail about the normalization of a wavefunction.	6



- b) Derive the TISE in Spherical Polar Coordinates and comment on the azimuthal solution of the same. 8
- Q-6** **Attempt all questions** **(14)**
- a) Solve the commutation relation: $[L_x, L_y] = i\hbar L_z$ 7
- b) Explain in detail the Anomalous Zeeman Effect. 7
- Q-7** **Attempt all questions** **(14)**
- a) Derive the energy eigen value for a one dimensional Harmonic Oscillator problem. 7
- b) Write a note on Spin-Orbit coupling schemes used in Quantum Mechanics 7
- Q-8** **Attempt all questions** **(14)**
- a) Elaborate on Larmor's Precession and hence define the term Gyromagnetic Ratio. 7
- b) Discuss in detail the Zeeman Effect. 7

