


Name:			
Enrolment No:			
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, May 2022			
Course: QUANTUM MECHANICS II Program: M.Sc PHYSICS Course Code: PHYS 7018		Semester : II Time : 03 hrs. Max. Marks : 100	
Instructions:			
SECTION A (5Qx4M= 20 Marks)			
S. No.		Marks	CO
Q 1	What is the significance of Eigen values and Eigen vectors in Quantum Physics?	4	CO1
Q 2	What is a Projection operator?	4	CO1
Q 3	Exchange interaction is yet another altogether 'Quantum' entity. What is it?	4	CO2
Q 4	What are Hermitian operators? Give their significance in Quantum Physics.	2+2	CO1
Q 5	What is linear independence of basis vectors? Use mathematical expression(s) for clarity.	4	CO1
SECTION B (4Qx10M= 40 Marks)			
Q 6	Are Fermions and Bosons distinguishable? Explain.	10	CO4
Q 7	Appraise the principle behind WKB approximation used in Quantum Physics.	10	CO2
Q 8	What are the different types of reference frames considered in a scattering experiment? Compare them.	10	CO3
Q 9	Elaborate on Anti-Symmetric wave functions. OR Write a short note on Dirac equations.	10	CO4
SECTION-C (2Qx20M=40 Marks)			
Q 10	Define a) Differential scattering cross section, b) total scattering cross section, and c) scattering amplitude, with proper notations. Solve scattering of a particle with another quantum mechanically and obtain an expression for the scattering amplitude.	9+11	CO3

	OR		
	Consider the scattering to be happening at low energy and obtain the above required quantity by the method of partial waves.		
Q 11	What is Stark effect? If the energy levels of the atom are known, derive/adopt a method and evaluate the new energy levels of an atom showing this effect.	4+16	CO1