## Unit IV

7. (a) Explain and discuss the semi-classical theory of radiations and find the expression for transition probability for induced absorption. 15
(b) What are forbidden and allowed transitions ? Discuss the selection rules governing these transitions. $\mathbf{5}$
8. (a) Derive Klein-Gordon relativistic equation for hydrogen like atom and discuss its limitations.

16
(b) What do you understand with negative energy states ?4
$\qquad$

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## M. Sc. EXAMINATION, May 2018

(Third Semester) (Re-appear Only) PHYSICS

PHY603B
Quantum Mechanics-II

Time : 3 Hours] [Maximum Marks : 100
Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt Five questions in all, selecting at least one question from each Unit. All questions carry equal marks.
P.T.O.

## Unit I

1. (a) What is WKB Approximation ? Explain it for one dimensional problem. 14
(b) Discuss the validity of WKB approximation. 3
(c) What are connection formulae ? 3
2. (a) Explain time dependent first order perturbation theory and find the expression for transition probability and also discuss its variation with frequency.
(b) What is Harmonic Perturbation? 20

## Unit II

3. (a) Explain Born approximation and discuss its validity for screened coulomb potential.

14
(b) What is partial wave analysis ? Discuss its applicability ? 4
(c) What are Bessel and Neymann functions ?

2

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2
4. (a) Explain atomic scattering of electrons and derive Rutherford formula for scattering cross-section.
(b) Explain the scattering by a hand sphere in the low energy approximation.

## Unit III

5. (a) Explain and discuss the phenomenon of collision of two idential particles. 12
(b) Explain the three statistics of identical particles and find the total number of states occupied by two identical particles.

5
(c) Write the four eigen functions of $\sigma^{2}$ for two electrons system.3
6. (a) What are Pauli spin operators and matrices ? Establish relationships among them.14
(b) Find the value of $\left(\sigma_{x}+i \sigma_{y}\right)_{1} \alpha(1) . \quad 3$
(c) Find the commutation value of $\left[\sigma_{x}, \sigma_{y}\right]$.

3
P.T.O.

