

SECOND SEMESTER

16 MPYC-201(Quantum Mechanics-II)

Marks-100

Unit-I

Approximation Method for stationary states:

Rayleigh-Schrodinger Method for Time-independent Non degenerate Perturbation theory, First and second order correction, perturbed harmonic oscillator, Anharmonic oscillator, The Stark effect, Quadratic Stark Effect and polarizability of hydrogen atom, Degenerate perturbation theory, Removal of Degeneracy, parity selection rule, linear Stark effect of hydrogen atom, Spin orbit Coupling, Relativistic correction, fine structure of Hydrogen like atom, normal and anomalous Zeeman effect, The strong-field Zeeman effect, The weak-field Zeeman effect and Lande g-factor. Elementary ideas about field quantization and particle processes. (10)

Unit-II

Variational Methods:

General formalism, Validity of WKB approximation method, Connection Formulas, Bohr quantisation rule, Application to Harmonic oscillator, Bound states for potential well with one rigid wall and two rigid walls, Tunneling through potential Barrier, Cold emission, Alpha decay and Geiger-Nuttall relation.

Time dependent perturbation Theory:

Transition probability, constant and harmonic perturbation, Fermi golden rule, and electric dipole Radiation and Selection Rule, Spontaneous emission Einstein's A, B- coefficient, Basic principle of laser and Maser. (15)

Unit-III

Scattering Theory:

Scattering amplitude and Cross section. Born approximation, Application to Coulomb and Screened Coulomb potential, Partial wave analysis for elastic and inelastic Scattering. Effective range and Scattering length, Optical theorem, Black Disc Scattering, Hard-sphere Scattering, Resonance Scattering from square well potential. (15)

Books:

1. Quantum Mechanics S. Gasiorowicz
2. Quantum Mechanics J. Sukurai
3. Quantum Mechanics R. Shankar
4. Quantum Mechanics S.N. Biswas
5. Quantum Mechanics A. Das
6. Quantum Mechanics A. Ghatak and S. Lokanathan
7. Advanced Quantum Mechanics P. Roman
8. Quantum Mechanics (Non Relativistic theory) L.D. Landau and E.M. Lifshitz
9. Elementary Theory of Angular Momentum M.E. Rose
10. Principles of Quantum Mechanics P.A.M. Dirac
11. Quantum Mechanics, Concept and Applications, N Zettili