Code No. 1654 / CORE

# FACULTY OF SCIENCE

## M. Sc. IV – Semester (CBCS) Examination, October 2020

### Subject : Physics

### Paper – I : Nuclear Physics

**Time : 2 Hours** **Max. Marks: 80**

## PART – A

**Note : Answer any five questions.** **(5x7=35 Marks)**

1 State Heisenberg and Yukawa exchange forces.
2 Write Semi empirical mass formula and explain it.
3 Explain α-decay.
4 What is multiple radiation?
5 Explain about Range-Energy relation.
6 Write a note on solid state detectors.
7 Discuss the theory of fission and fusion reactions.
8 Write a short note on Lepton and Baryon numbers.

## PART – B

**Note : Answer any three questions.** **(3x15=45 Marks)**

9 Explain the salient features of liquid drop model and Shell model.

10 Discuss the deuteron problem and its contribution to the nuclear force.

11 Discuss the Gamow's theory of α-decay and fine structure of α-spectrum.

12 State and explain the Fermi's theory of β-decay and Fermi Kurie plot.

13 Discuss the interaction of gamma rays with matter and Photoelectric effect.

14 Explain in detail scintillation detectors and gamma ray detection with gas.

15 Explain the kinematics of nuclear reaction and obtain an expression for Q-value of reaction.

16 Discuss the classification of elementary particles and quark modal.

Code No. 1311 / CORE

# FACULTY OF SCIENCE

## M. Sc. II – Semester (CBCS) Examination, December 2020

**Subject : Physics & Applied Electronics / Astrophysics**

**Paper – III : Quantum Mechanics-II**

Time : 2 Hours | Max. Marks: 80

## PART – A

Note : Answer any five questions. (5x7=35 Marks)

1 Define differential and total scattering cross-section terms in scattering process.
2 What is optical theorem and write its significance.
3 What are the selection rules for dipole transitions?
4 What is the principle of method of variations?
5 What is Fermi's Golden rule? Write its significance.
6 A harmonic oscillator of natural frequency ($\omega$) is placed in a small external potential $(1/2)bx$, then calculate the change in energy of the ground state.
7 What re the inadequacies of Klain Gordan equation?
8 Explain the Dirac Energy spectrum.

## PART – B

Note : Answer any three questions. (3x15=45 Marks)

9 Discuss the method of partial waves and obtain an expression for scattering amplitude and scattering cross section.

10 Construct Green's function for an out going wave in scattering problem and use it to calculate the amplitude in first Born approximation.

11 Discuss the time independent perturbation theory for a non-degenerate stationary system and obtain the corrected eigen functions and energy eigen values.

12 Discuss the method of WKS approximation and derive an expression for transition probability through potential barrier and hence explain alpha decay.

13 Using the time dependent perturbation theory, derive an expression for the rate of transition to the continuum.

14 Discuss the Einstein coefficients of spontaneous and induced emission of radiation. Establish a relationship between A and B coefficients.

15 Drive Klein-Gordan relativistic equation for a free particle and write Klein Gardon equation in co-variant form.

16 Derive the Dirac's relativistic equation. Obtain the plane wave solutions of Dirac's equation for free particles and explain the existence of spin.