CENTRAL UNIVERSITY OF HARYANA

Term End Examinations, June 2022

Programme: M.Sc. Physics **Session: 2021-22**

Semester : IV **Max. Time: 3 Hours**

Course Title: Nuclear Physics: Interaction & Detection **Max. Marks: 70**

Course Code: SBS PHY 01 401 DCEC3104

Instructions:

1. **Question no. 1 has seven sub parts and students need to answer any four. Each sub part carries three and half Marks.**

2. **Question no. 2 to 5 have three sub parts and students need to answer any two sub parts of each question. Each sub part carries seven marks.**

Question No. 1. (4X3.5=14)

a) Write the configuration of protons for the nuclei $^{14}N_7$ and $^{197}Au_{118}$.

b) What is basic principle of alternating grading synchrotron?

c) Draw shapes for different modes of vibrations for nuclei.

d) Write a short note on nuclear charge density.

e) List the advantages and disadvantages of storage ring accelerators.

f) Draw the block diagram for a Cerenkov detector.

g) Briefly explain the different type of scintillators.

Question No. 2. (2X7=14)

a) Discuss the meson theory of exchange forces. List the drawback of meson theoretical potential.

b) Derive the expression for probing charge distribution using electron.

c) Elaborate the concept of EMC effect in deep-inelastic scattering.

Question No. 3. (2X7=14)

a) Discuss the Nilsson model in detail.

b) What are nuclear deformations? How these deformations leads to quadrupole moments?

c) Discuss the magnetic moments and Schmidt lines.

Question No. 4. (2X7=14)

a) Draw block diagram for a Scintillation counter and explain its working.

b) Explain the working of a semiconductor detector. What are the advantages of HPGe detector?

c) How charge particle interact with matter. Explain the working of a Ionization detector.

Question No. 5. (2X7=14)

a) Why acceleration of particle is required? Explain the working of a linear accelerator (LINAC).

b) How beta particles are generated? Explain the working of a betatron.

c) How nuclear ions are produced? Briefly explain the methods to produce positive ions.