(ii) **Questions   : 9**   **Sub. Code :** | 3 | 2 | 3 | 7 |

Exam. Code : | 4 | 7 | 4 |

M.Sc. 3rd Semester
1125
PHYSICS
Paper—Phy-7003 : Nuclear Physics—II

Time Allowed : Three Hours]   **[Maximum Marks : 60**

Note :— The candidates are required to attempt **ONE** question each from Sections A, B, C, D carrying 12 marks and Section E is compulsory and its parts carry 2 marks each.

SECTION—A

1. (a) Discuss nuclear shell model and various potentials used in single particle shell model.   8

    (b) Define Racah Coefficients.   4

2. (a) Discuss the Russell-Saunders coupling (L-S coupling) and j-j coupling schemes.   8

    (b) What do you infer from Nordheim's rules about the existence of odd-odd nuclei with ground states 0^+ or 1^- ?   4

SECTION—B

3. (a) Define the Rotation matrix and explain how the rotation about an arbitrary axis X can be expressed in terms of Euler angles of rotation.   6

(b) Write a note on β and γ vibrations in spheroidal nucleus.

6

4. (a) What is nuclear rotational motion ? Derive rotational energy spectra and nuclear wave functions for Even-even nuclei.

6

(b) Write a note on Nuclear moments.

6

SECTION—C

5. (a) What is optical model ? Derive the theoretical cross-sections with optical model and compare it with experimental results.

8

(b) What are Stripping and Pick Up reactions ? Explain with example.

4

6. (a) Derive the Breit-Wigner Dispersion formula.

8

(b) Write a brief note on statistical theory of nuclear reactions.

4

SECTION—D

7. (a) Write a brief note on the Population of high spin states.

4

(b) Describe Nilsson model of nuclei and its uses to explain nuclear properties.

8

8. (a) Explain and derive the Cranking shell model.

8

(b) Write a note on production of Super heavy elements.

4

SECTION—E

9. (a) Write a note on nuclear isomerism.

   (b) Write down the shell configurations for $_{30}Zn^{67}$ and $_{43}Tc^{99}$.

   (c) What do you mean by vibrational nucleus ?

   (d) Write a short note on Kinematic Moment of Inertia.

   (e) What are different types of nuclear reactions ?

   (f) What do you mean by nuclear halos ? $6×2=12$