

M.Sc.(Physics) (C.B.C.S. Pattern) Sem-IV
PSCPHYT13 - Paper-XIII (Core-II) - PSCPHY-11 :
Nuclear and Particle Physics

P. Pages : 2

Time : Three Hours



GUG/S/19/11412

Max. Marks : 80

Notes : 1. All questions are compulsory.

- 1.** Either
- a) Explain how the inclusion of spin-orbit potential gives the proper separation of subshell and verify all the magic numbers. **8**
 - b) With the help of liquid drop model obtain the condition for stability of nucleus against β -disintegration process. **8**

OR

- e) For a nucleus, obtain an expression for - **8**
 - i) Electric quadrupole moment
 - ii) Magnetic dipole moment.
- f) What are Schmidt lines ? Explain Schmidt diagrams separately for odd proton and odd neutron nuclei. **8**

- 2.** Either
- a) Show that the nuclear reaction cross-section may exceed the geometrical cross-section of nucleus. **8**
 - b) Explain forbidden and allowed states in β -decay process. **8**

OR

- e) What are the assumptions made in compound nucleus hypothesis ? Give suitable examples of nuclear reactions to support your answer. **8**
- f) Discuss multipole transition of nuclei in gamma decay. **8**

- 3.** Either
- a) Explain with neat diagram the working of scintillation detector. **8**
 - b) Describe regions of multiplicative operation of nuclear detector. **8**

OR

- e) Explain the working principle of Betatron. Obtain Betatron equation. **8**
- f) Explain with neat diagram, the principle and working of Van-de-Graaff accelerator. **8**

4. Either
- a) Explain SU(3) symmetry of elementary particles. Draw Meson octet and Baryon octet. 8
 - b) Give the classification scheme of elementary particles. 8

OR

- e) Discuss the unification scheme of Electro-weak interaction. 8
- f) State elementary ideas of CP and CPT invariance. Explain in detail. 8

5. Answer all the following.

- a) Explain binding energy curve. 4
- b) Discuss stripping and pick-up reaction. 4
- c) What are advantages of semiconductor detector. 4
- d) Explain Gell Mann - Nishijima formula. 4
