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Reg. No. : .....

Name : .....

Fourth Semester M.Sc. Degree Examination, March 2021

Physics

PH 242 : NUCLEAR AND PARTICLE PHYSICS

(2018 Admission onwards)

Time : 3 Hours Max. Marks : 75

PART – A

Answer **any five** questions. **Each** question carries **3** marks.

I. (a) Write the similarity between (n-n) and (p-p) forces.

(b) Write any three evidences to show the existence of shell structure with in nuclei.

(c) Write any six conservation laws in nuclear reactions.

(d) Write a short note on optical model of nuclear reactions.

(e) Write a short note on energy in fission reaction.

(f) Explain briefly the working of G M Counter.

(g) Discuss briefly the linear accelerators

(h) Briefly explain grand unified theory.

(5 × 3 = 15 Marks)

P.T.O.

PART – B

Answer **all** questions. **Each** question carries **15** marks.

II. (a) Explain

(i) Meson theory of nuclear force and

(ii) Exchange force and its implications.

OR

(b) Explain liquid drop model with Bethe-Weizsacker formula.

III. (a) Discuss Bohr and Wheelers theory of nuclear fission.

OR

(b) Discuss nuclear fusion process and explain controlled nuclear fusion reactors.

IV. (a) Discuss the principle and working of

(i) Cyclotron and

(ii) Synchrotron.

OR

(b) Explain the classification of elementary particle and conservation laws of elementary particles.

(3 × 15 = 45 Marks)

PART – C

Answer **any three** of the following questions. **Each** question carries **5** marks.

V. (a) Derive the expression for the phase shift δ_o for law energy neutron – proton scattering.

(b) Derive the expression for the coulomb potential energy for all the protons within the nucleus.

(c) Calculate the energy release in the symmetric fission of the nuclei with the values of

(i) $A = 238$ and $Z = 92$,

(ii) $A = 200$ and $Z = 80$,

(iii) $A = 160$ and $Z = 64$.

Assume $a^2 = 0.019114\ u$, $a^3 = 0.0007626u$.

(d) Show that total energy release in each of the six reactions of the carbon cycle is 26.7 MeV.

(e) Analyze the following decays according to their quark content.

(i) $\Omega^- \rightarrow \Lambda^0 + K^-$

(ii) $K^- \rightarrow \pi^0 + \pi^+$

(iii) $\Xi^- \rightarrow \Lambda^0 + \pi^-$

(f) Assuming a magnetic field of 1.4T, compute the maximum energy of protons and deuterons, that can be obtained from a cyclotron of 75 cm radius.

(3 × 5 = 15 Mark)