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Roll No. .....

ID—6388

Bachelor of Science EXAMINATION, 2022

(Batch 2019-2020)

(Sixth Semester)

NUCLEAR PHYSIC

Code : Phy-602

Time : 3 *Hours* *Maximum Marks* : 45

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : *Attempt Five* questions in all. Q. No. 1 is compulsory. All questions carry equal marks. Use of scientific calculator (non-programmable) is allowed.

(Compulsory Question)

1. (a) Why electrons cannot exist inside the nucleus ?
   (b) Express MeV in Joules.
   (c) What is parity of a wave fuction given as $\psi(x) = \sin(x)$?
   (d) What is an beta decay ?
   (e) What is pair production ?
   (f) What is strangling ?
   (g) What is fast breeder reactor ?
   (h) Define reaction threshold energy.
   (i) Can neutrons bè accelerated by a cyclotron ? **1×9=9**

2. (a) What is Moseley's Law ? Discuss how charge of nucleus is determined by it. **5**
   (b) An α-particle of energy 4 MeV are scattered back from a gold foil ($Z = 79$). Calculate the maximum volume in which the positive charge of atom is likely to be concentrated. **4**

3. (a) Write short notes on the following :

(i) Quadupole moment 2

(ii) Parity 2

(iii) Nuclear spin. 2

(b) Explain, how to achieve velocity selection in a mass spectrograph. 3

4. (a) What is a pair-production ? How is it explained by Dirac theory ? 5

(b) Find the threshold wavelength for Proton-antiproton production the rest mass of a Proton or antiproton is 938 MeV. 4

5. (a) What is α decay ? Discuss and energetics of α decay.

(b) Find the change in wavelength of X-Ray Photon when it is scattered through an angle of 90 degree by a free electron. 3

6. Explain construction and working of drift type linear accelerator with necessary theory. 9

P.T.O.

7. Give the principle, construction, working, and uses of io proportional counter. 9

8. (a) Discuss various types of nuclear reactions and also discuss conservation laws associated with them. 6

(b) In a nuclear reactor explain the role of moderator and control rod. 3