

Roll No.

Total Pages : 03

MDQ/D-20

5078

NUCLEAR PHYSICS-I

PHY-303-B

Time : Three Hours]

[Maximum Marks : 60

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory.

Compulsory Question

1. (a) How will differentiate gamma rays and neutrons ?
2
- (b) For the identification of $^{56}\text{Fe}^{+7}$, which detector will be required ? Explain. 3
- (c) Can you measure the energy of nuclear radiations using a solid state detector without using a pre-amplifier ? Explain. 3
- (d) What is the role of SF_6 in Pelletron accelerator ? Explain. 2
- (e) Can we use U-238 in a reactor ? Explain. 2

Unit I

2. (a) What do you understand by a ΔE -E telescope for particle identification ? What are its limitations ? Describe the method which can overcome these limitations. What are its advantages ? 7

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1

- (b) Discuss the basic principle and working of a position sensitive ionization chamber using its schematic diagram. **5**
3. What do you understand by 'Event by Event Particle Identification System' ? Describe the basic principle and methodology involved in such a system used for proton induced nuclear reaction analysis. Also give some examples. **12**

Unit II

4. (a) Discuss the principle and working of a charge sensitive pre-amplifier using a schematic diagram. What do you mean by its sensitivity ? Explain. **6**
- (b) Describe the method of Delay Line unipolar and bipolar pulse shaping in the amplifier. **6**
5. (a) Discuss the basic principle of slow-fast coincidence and sum coincidence techniques using their suitable block diagrams. **6**
- (b) Discuss the basic principle and working of Multi-Channel Analyzer. How does it differ from Single Channel Analyzer ? **6**

Unit III

6. (a) What are negative ions ? How will you generate the negative ions using SNICS ion source ? **4**

(b) $^{56}\text{Fe}^{+5}$ ions are required to be accelerated to 50 MeV. How will you achieve it ? Discuss in detail.

8

7. (a) 100 keV N^+ ions are implanted in Iron and Aluminium simultaneously. Discuss in which out of these two, N^+ will have more projected range. **4**

(b) Discuss the process of Ion Beam Sputtering in solids.

4

(c) Discuss the process of Ion beam channeling. **4**

Unit IV

8. (a) How will you differentiate neutrons on the basis of their energy ? **2**

(b) What are prompt and delayed neutrons ? What is the role of delayed neutrons in the control of reactors ? **5**

(c) What are fissile and fertile materials ? How do you convert a fertile material into a fissile one ? Explain giving suitable examples. **5**

9. (a) Describe the concept of a Fusion reactor. Explain it by giving suitable examples. **6**

(b) Explain the basic principle and working of fission reactor using a block diagram. **6**