

Reg. No.					

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DEPARTMENT OF SCIENCES, M.Sc (PHYSICS) II SEMESTER END SEMESTER EXAMINATIONS, APRIL 2017

SUBJECT: NUCLEAR AND PARTICLE PHYSICS [PHY 608]

(REVISED CREDIT SYSTEM)

Time:	3 Hours	MAX. MARKS: 50
Note:	(i) Answer Any Five of the following questions.	

(ii) Any missing data may be suitably assumed.

- 1. (a) Describe the method of estimation of nuclear radius by α scattering experiment
 - (b) Radio nuclides are useful source of small amounts of energy in space vehicles, remote communication systems etc. One such radio nuclide is Po-210. Calculate the power available in watts from a 10 mg of Po-210. It is an emitter with an energy of 5.3 MeV. Given : Half life of Po-210 is 138 days
- 2. (a) Describe Cowan's and Reins experiment for the detection of neutrino.
 - (b) In an absorption experiment with 1.14 MeV γ-radiation from Zn-65, it is found that 20 cm of AI reduced the beam intensity to 3%. Calculate the half value thickness of AI for this radiation
 [6+4 =10]
- 3. (a) Plot the graph of log(pulse amplitude) vs. applied voltage in a gas filled counter and hence explain the different regions in detail.
 - (b) A proton is completely stopped in an ionization chamber produces 3.1 x 10⁵ ion-pairs. What is the kinetic energy of proton? Also calculate the pulse voltage and current flowing in an external circuit having load resistance of 0.5 MΩ. Given capacitance of the ionization chamber is 25 pF and W for the gas is 32 eV. [6+4=10]
- 4. (a) Derive an expression for Q-value of a nuclear reaction in the lab system. How it is related to the threshold energy of an endoergic nuclear reaction?
- (b) Discuss Fermi gas model and hence arrive at equations for the Fermi energy of protons and neutrons. [5+5=10]
- 5. (a) Write a note on classification of fundamental forces and elementary particles
 (b) Explain Yukawa's meson theory and list the properties of Pi-mesons [6+4=10]

- 6. (a) Discuss the (i) condition for controlled chain reaction, (ii) critical size and (iii) effect of Reflectors
 - (b) Write a short note on radiation types, its sources and applications [6+4=10]