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DEPARTMENT OF SCIENCES, M. Sc. (P/C/M/G) IV SEMESTER END SEMESTER EXAMINATIONS APRIL 2017 Subject: Nuclear Physics II (PHY-706.6) (REVISED CREDIT SYSTEM)

Time: 3 Hours Date: 24 April 2017 MAX. MARKS: 50

Note: (i) Answer any five full questions. (ii) Answer the questions to the point.

1. (i) Using one experimental observation prove that nuclear forces are spin dependent. [5]

(ii) Calculate the n-p scattering differential cross section at $\theta = 90^{\circ}$ from the following data: $E_{c.m.} = 5MeV, \delta_0 = 50^{\circ}, \delta_1 = 20^{\circ}, \text{ and } \delta_2 = 5^{\circ}$. [5]

2. (i) Write a comparative note on exchange potential. [5] (ii) Estimate the percentage of D-state from the magnetic moments of ³H and ³He systems. (Given $\mu(^{3}H) = 2.9786nm$, $\mu(^{3}He) =$ -2.1274nm, $\mu(p) = 2.7928nm$, and $\mu(n) = -1.9131nm$) [5]

3. Obtain the energy level diagram of single particle shell model with harmonic oscillator potential and spin-orbit interaction. Which magic numbers are explained by this model? [8+2]

4. (i) Write main assumptions of collective model. [5](ii) Obtain the expression of Hamiltonian for Nilsson model? [5]

5. (i) Qualitatively discuss the compound nucleus reaction mechanism. [4]

(ii) What are the differences between the direct nuclear reaction and compound nuclear reactions? [3]

(iii) Show that at low energy compound nuclear reaction mechanism is more probable. [3] 6. (i) Write a short note on reaction channel. [4](ii) For a two body reaction of type A(a,b)B show

$$E_b \frac{M_B}{M_B + M_b} = E_a \frac{M_A}{M_A + M_a} + Q \qquad [6]$$