Roll No. .....

41274

B. Sc. (Hons.) Physics 4th Semester Examination – May, 2019

ATOMIC AND NUCLEAR PHYSICS

Paper : Phy-404

Time : Three Hours] *[Maximum Marks : 40*

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

Note : Attempt ***five*** questions in all, selecting at least ***two*** questions from each section. All questions carry equal marks.

SECTION – I

1. (a) Distinguish between normal and anomalous Zeeman Effect. Discuss classical theory of Normal Zeeman effect. 5

   (b) Show Normal Zeeman effect for transitions arising out of a p-d system. 3

2. Write notes on :

   (a) Pauli's Exclusion Principle 3

   (b) Symmetric and Non-symmetric Wave functions 3

   (c) Compute Zeeman components for transition $^2D_{3/2} \rightarrow {}^2P_{3/2}$ 2

P. T. O.

3. What is L-S coupling ? Explain interaction energy i
L S coupling.

4. What are the main features of fine structure in spect
of alkali metals ? Explain the doublet fine structure
spectra of alkali metals on the basis of spin or
interaction.

SECTION – II

5. Discuss the theory of successive disintegration
radioactive substances and obtain conditions
transient and secular equilibrium.

6. (a) Explain the liquid drop model of nucleus.

(b) Derive the semi-empirical mass formula.

7. (a) State and explain the laws of radioac
disintegration. Derive relation between mean
and disintegration constant.

(b) Calculate decay constant of Radium if its half
is 1590 years.

8. (a) What is the binding energy curve ? Discus
main features of average binding energy curv

(b) Calculate the binding energy per nucleon of
Given mass of ${}_8O^{16} = 15.99498$ a. m. u., m
${}_1H^1 = 1.007825$ a. m. u., mass of ${}_0n^1 = 1.00$
a. m. u.

(b) The manufactures of a certain make of electric bulbs claims that his bulbs have a mean life of 2 months with a standard deviation of 5 month. A random sample of 6 such bulbs gave the following values :

Life in months : 24, 26, 30, 20, 20, 18

Can you regard the producer's claim to be valid at 1% level of significance ? (Given that the table values of the appropriate test statistics at the said level are 4.032, 3.707 and 3.499 for 5,6 and 7 degrees of freedom respectively. 4

8. (a) What is meant by sampling distribution and standard error ? Explain write standard error of mean. 4

(b) Two random samples gave the following results : 4

Sample	Size	Sample mean	Sum of square of deviations from mean
1	10	15	90
2	12	14	108

Test whether the sample come from the same normal population at 5% level of significance.