62132

Reg. No. | | | | | | | | |

IV Semester M.Sc. Degree Examination, September/October - 2022

PHYSICS

Methods of Data Analysis

(CBCS Scheme 2020-21)

Paper : PHY402

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates: ***Answer ALL questions.***

1. a) Arrive at an expression for error propagation in linear and orthogonal transformations.
   b) Define variance, covariance and correlation for 2 variables. **(10+5)**

(OR)

2. a) Two cards are drawn at random and without replacement from a pack of 52 playing cards. Find the probability that both the cards are black.
   b) If three coins are tossed simultaneously, the event E is three heads or three tails, F is at least two heads and G is at most two heads. From the pairs (E, F); (E, G) and (F,G), estimate which are dependent and independent?
   c) An instructor has a question bank consisting of 300 easy, True/False questions, 200 difficult, True/False questions, 500 easy, multiple choice questions and 400 difficult, multiple choice questions. If a question is selected at random from the question bank, what is the probability that it will be an easy question given that it is a multiple choice question? **(5+5+5)**

3. a) Prove that Poisson's distribution is the limiting case of binomial distribution.
   b) Explain the hypergeometric distribution and its properties. **(10+5)**

(OR)

4. a) State and prove the central limit theorem.
   b) Define standard normal distribution. Obtain the probability density function of normal variable with (i) mean 0 and standard deviation 2 (ii) mean 10 and variance 9. **(8+7)**

5. a) Arrive at an expression for expectation value and variance in a Gaussian distribution.
   b) What is hypothesis testing? Give three examples for null hypothesis.

(OR)

6. a) How Chi-square test can be used for the goodness of fit with maximal number of degrees of freedom.
   b) Explain the graphical representation of the samples. **(10+5)**

[P.T.O.

7. Answer any **FIVE** of the following questions: **(5×5=25)**

a) Explain the concepts of probability with an example and give the laws of probability

b) Verify the function $f(x)=\begin{cases}6x(1-x), & 0\le x\le 1\\ 0, & otherwise\end{cases}$ is probability density function (PDF) or not. Find out the mean and standard deviation.

c) Explain the errors of observation and measurements.

d) What is a characteristic function and give its significance?

e) Explain mean square deviation with example.

f) Explain the concept of normalized data plots.
