K23P 0209

Reg. No. : .....

Name : .....

IV Semester M.Sc. Degree (CBSS – Reg./Supple./Imp.)
Examination, April 2023
(2019 Admission Onwards)
PHYSICS
PHY 4C15 : Numerical Techniques and Probability

Time : 3 Hours Max. Marks : 60

SECTION – A

Answer **both** the questions (Either **a** or **b**). **(2×12=24)**

1. a) Explain in detail the properties of binomial, poisson and normal distributions.

OR

b) Derive Newton's forward interpolation formula. Hence deduce Newton's backward interpolation formula.

2. a) i) Explain Simpson 3/8 rule.

ii) Briefly explain Newton Raphson method for finding the real root of an equation.

OR

b) Explain the Milne's method for obtaining numerical solution of ordinary differential equations. Also explain Milne's correction.

SECTION – B

Answer **any four** questions (**one** mark for Part **a**, **3** marks for Part **b**, **5** marks for Part **c**). **(4×9=36)**

3. a) If a letter is chosen at random from the English alphabet, find the probability that the letter is a vowel.

b) State and explain the addition theorem of probability.

c) Two identical boxes contain respectively 4 white and 3 red balls, and 3 white and 7 red balls. A box is chosen at random and a ball is drawn from it. If the ball is white, what is the probability that it is from the first box ?

P.T.O.

4. a) What is Poisson Distribution ?

   b) The mean and variance of a binomial random variable x are 16 and 8 respectively. Find P(x = 0) and P(x = 1).

   c) The weekly wages of 1000 workmen are normally distributed about a mean of Rs. 500 with a standard deviation of 50. Estimate the number of workers whose weekly wages will be (i) between Rs. 400 and Rs. 600 (ii) less than Rs. 400.

5. a) Write the Lagrange's Interpolation formula.

   b) Form a forward difference table for the following data.

x	0	1	2	3	4
y	8	11	9	15	6

   c) Determine the constants a and b by the method of least squares such that $y = ae^{bx}$ fits the following data.

x	2	4	6	8	10
y	4.077	11.084	30.128	81.897	222.62

6. a) What is Chi-square test ?

   b) What are the conditions for the validity of Chi-square test ?

   c) The number of automobile accidents per week in a certain community are as follows :

   12, 8, 20, 2, 14, 10, 15, 6, 9, 4. Calculate the value of Chi-square.

7. a) What are transcendental equations?

   b) Give an account of iteration method for obtaining solutions of transcendental equations.

   c) Using Newton Raphson method, find a real root of the equation $x^3 - 3x + 1 = 0$ lying between 1 and 2 correct to three decimal places.

8. a) Write the Runge Kutta second order formula.

   b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule with h = 0.2. Hence determine the value of π.

   c) Using Modified Euler's method, solve $\frac{dy}{dx} = 1 + xy$ with y(0) = 2. Find y(0.2).

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