K21P 0245

Reg. No. : .....

Name : .....

IV Semester M.Sc. Degree (CBSS – Reg./Suppl. (Including Mercy Chance)/Imp.) Examination, April 2021
(2014 Admission Onwards)
PHYSICS
PHY4C15 – Numerical Techniques and Probability

Time : 3 Hours Max. Marks : 60

SECTION – A

Answer both the questions. (Either **a** or **b** or **c**).

1. a) Obtain Euler's formula and Modified Euler's formula and give its geometrical significance for the numerical solution of the differential equation.

OR

b) i) Explain Newton-Raphson method and give its geometrical meaning.

ii) Obtain the criterion for the convergence in Newton-Raphson method.

OR

c) i) Explain Poisson's distribution. Which are the constants of Poisson's distribution ?

ii) Define binomial distribution. Under what conditions does it tend to Poisson distribution.

2. a) i) Define Probability. Differentiate between dependent and independent events.

ii) Explain Bayes' theorem.

OR

b) i) Explain the error propagation in a difference table.

ii) The following table gives the values of y which is a polynomial of degree 5. It is known that y = f(3) is in error. Correct the error.

x	0	1	2	3	4	5	6
y	1	2	33	254	1025	3126	7777

OR

P.T.O.

c) i) Derive Lagrange's interpolation formula for unequal intervals.

ii) Use Lagrange's formula to fit a polynomial to the data and hence find y(x = 1).

X	–1	0	2	3
Y	–8	3	1	12

(2×12=24)

SECTION – B

Answer **any four** questions (**One** mark for Part **a**, **3** marks for Part **b**, **5** marks for Part **c**).

3. a) A bag contains 6 white, 4 red and 10 green balls. Two balls are drawn at random. Find the probability that there will be both green.

   b) State and prove multiplication theorem of probability.

   c) Explain mutually exclusive events and equally likely events. Give an example to both.

4. a) When will we use Legrange's Interpolation formula ?

   b) By the method of least squares find the best fitting straight line to the data given below.

x	5	10	15	20	25
y	15	19	23	26	30

   c) Obtain Newton's backward interpolation formula for equal intervals.

5. a) Give the important property of Gauss Quadrature formula.

   b) Briefly explain Simpson's $\frac{3}{8}$ rule.

   c) Evaluate $\int_0^1 \frac{dx}{1+x^2}$, using Trapezoidal rule with h = 0.2. Hence obtain an approximate value of π. Can you use Simpson's formula in this case ?

6. a) What is the order of convergence of Newton Raphson method ?

   b) How does the Runge-Kutta method works ? Write Runge-Kutta second order formulae.

   c) Using Milne's method find y (4.4). Given $5xy' + y^2 - 2 = 0$, y(4) = 1, y(4.1) = 1.0049, y(4.2) = 1.0097, y(4.3) = 1.0143.

7. a) Give the order of convergence of an iterative process.

   b) Explain the graph of Normal Distribution.

   c) Solve for a positive root of $x^3 - 4x + 1 = 0$ by Regula Falsi method.

8. a) Give the constants of Binomial distribution.

   b) Mention the applications of Chi-Square distribution.

   c) What are the chief properties of binomial distribution ?

9. a) How will you fit a Poisson distribution ?

   b) Solve $e^x - 3x = 0$ by the method of iteration.

   c) Derive the probability distribution function of Chi-square distribution with n degrees of freedom.

10. a) What is the area under the curve in each Chi-square distribution ?

    b) What do you understand by the test of goodness of fit ?

    c) Find the 1st and 2nd order differences for $f(x) = ab^{cx}$. **(4×9=36)**