

Reg. No. :

Name :

**IV Semester M.Sc. Degree (C.B.S.S. – Reg./Supple.-(One Time Mercy
Chance)/Imp.) Examination, April 2024
(2014 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**).

1. a) i) Derive Lagrange's interpolation formula for unequal intervals.
 ii) Obtain the Euler's Formula for the numerical solution of the differential equation. Why modified Euler's method is preferred over Euler's method.

OR

- b) Obtain Newton-Cote's quadrature formula. Hence deduce Trapezoidal rule and Simpson's 1/3 rule.
2. a) Give an account of Chi-square distribution. Explain the probability density function of Chi-square distribution. Mention the applications of Chi-square distribution.

OR

- b) i) Discuss the theorems of probability.
 ii) Briefly explain Regula falsi method for finding the real root of an equation. (2×12=24)

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SECTION – B

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

3. a) What is the order of convergence of the method of successive approximations ?
 b) What are the conditions for the validity of Chi-square test ?
 c) Find the first and second order differences for $f(x) = ab^c x$.
4. a) When will we use Newton's forward interpolation formula ?
 b) Find a cubic polynomial which takes the following values : $y(1) = 24$, $y(3) = 120$, $y(5) = 336$ and $y(7) = 720$.
 c) Use Lagrange's interpolation formula to fit a polynomial to the data and hence find the value of y when $x = 2$.

x	0	1	3	4
y	-12	0	6	12

5. a) What is binomial distribution ?
 b) Evaluate the probability of obtaining atleast 2550 heads in tossing a coin 5000 times using Normal distribution.
 c) On a production line, the probability that an item is faulty is 0.1. 50 items are chosen at random and checked for faults. Find the probability that there will be no faulty items and also the probability that there will be three faulty items using (i) binomial distribution and (ii) Poisson distribution.
6. a) Write the Runge Kutta second order formula.
 b) Solve $\frac{dy}{dx} = 1 - y$, $y(0) = 0$ by Euler's method. Find y at $x = 0.1$ and $x = 0.2$.
 c) Evaluate $\int_0^1 \frac{dx}{1+x}$, correct to three decimal places using $h = 0.5$ using Trapezoidal and Simpson 1/3 rule.

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7. a) From a herd containing 5 Karan Fries and 4 Sahiwal cows, a cow is selected at random. What is the probability that it is a Sahiwal Cow ?
 b) Let X be a random variable with the probability distribution given below. Find the mean of X .

X	0	1	2	3
P(x)	$\frac{27}{64}$	$\frac{27}{64}$	$\frac{9}{64}$	$\frac{1}{64}$

- c) Two dice are rolled once. Find the probability that
 i) the numbers on the two dice are different.
 ii) the total is 7 or 9.
8. a) Give the formula for Newton-Raphson method.
 b) Give an account of iteration method for obtaining solutions of transcendental equations.
 c) Using Bisection method, find a positive real root of the equation $x \log_{10} x = 1.2$ in four iterations. (4×9=36)