K22P 3325

Reg. No. : .....

Name : .....

IV Semester M.Sc. Degree (C.B.S.S. – Reg./Supple./Imp.) Examination, April 2022
(2018 Admission Onwards)
PHYSICS
PHY – 4C15 : Numerical Techniques and Probability

Time : 3 Hours Max. Marks : 60

SECTION – A

Answer both questions, either **(a)** or **(b)**. **Each** question carries **12** marks.

1. a) Define normal distribution and standard normal distribution. Write important properties of standard normal distribution. What is the relation between normal distribution and binomial distribution.

OR

b) Write a note on chi-square distribution and important properties of chi-square distribution. Also explain the method of chi-square test for goodness of fit.

2. a) Derive Newton's backward interpolation formula for equal intervals. Using Newton's backward interpolation formula, find the value of y(2.65) from the following data.

x	−1	0	1	2	3
y	−21	6	15	12	3

OR

b) Derive formula for Simpson's one third rule of the numerical integration of $\int_a^b f(x)\,dx$. Also discuss the error in Trapezoidal rule. **(2×12=24)**

SECTION – B

Answer **any four** (1 mark for part '**a**', 3 marks for part '**b**', 5 marks for part '**c**').

3. a) State addition theorem for probability.

b) From a pack of 52 cards, two cards are drawn the first being replaced before the second is drawn. Find the probability that the first one is a diamond and second is a king.

c) State and prove Baye's theorem on probability.

P.T.O.

4. a) Define Poisson distribution.

   b) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution.

   c) Fit a binomial distribution to the following data :

x	0	1	2	3	4	5
f	12	56	74	39	18	1

5. a) Write the name of two methods to find the root of a transcendental equation.

   b) Explain the geometric interpretation of Newton-Raphson method.

   c) Using bisection method, find a real root of the equation $x^3 - x - 11 = 0$.

6. a) What do you mean by forward difference operator ?

   b) Find the first and second order differences for $f(x) = ab^{cx}$.

   c) Find the function whose first difference is $x^3 + 3x^2 + 5x + 12$.

7. a) What is the order of error in Trapezoidal rule for numerical integration ?

   b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by two point Gaussian quadrature formula and hence find the value of π.

   c) Evaluate $\int_0^{10} \frac{dx}{1+x^2}$ by using Trapezoidal rule.

8. a) Write Euler's modified formula to find the value of $y(x_1)$ from the differential equation $\frac{dy}{dx} = f(x, y), y(x_0) = y_0$.

   b) Using Euler's modified method, find the value of y at x = 0.1, given that $\frac{dy}{dx} = 1 + xy, y(0) = 2$.

   c) Compute y(0.1) by Runge-Kutta method of 4^{th} order for the differential equation $\frac{dy}{dx} = \frac{1}{x+y}, y(0) = 1$. **(4×9=36)**
