K18P 0264

Reg. No. : ....

Name : ....

Fourth Semester M.Sc. Degree (Reg./Suppl./Imp.) Examination, March 2018
PHYSICS
PHY4C15 : Numerical Techniques and Probability
(2014 Admission Onwards)

Time : 3 Hours

Max. Marks : 60

SECTION – A

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

1. a) i) Explain different definitions of probability. What are the important properties of probability ?

   ii) State and prove Baye's theorem for probability.

   OR

   b) Define Binomial distribution and Poisson distribution. Derive Poisson distribution as a limiting case of Binomial distribution.

2. a) i) Explain bisection method to find a real root of the equation $f(x) = 0$.

   ii) What do you mean by interpolation ? Derive Newton's forward interpolation formula for equal intervals.

   OR

   b) i) Explain Trapezoidal rule for numerical integration. What is the geometrical interpretation of Trapezoidal rule ?

   ii) Explain least square method for linear curve fitting. (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) What is the probability of drawing an ace from a well shuffled deck of 52 playing cards ?

   b) State and prove addition theorem of probability.

   c) Two similar urns A, B contain 2 white and 3 red balls, 4 white and 5 red balls respectively. If a ball is selected at random from one of the urns, then find the probability that the urn is B, when the ball is red.

P.T.O.

4. a) What are the constants of binomial distribution ?

   b) Explain Chi-square test of goodness of fit.

   c) If X is normally distributed with mean 8 and standard deviation 4, find $P(5 \le X \le 10)$ and $P(X \ge 15)$.

5. a) What is the order of convergence of Newton-Raphson formula ?

   b) Find the second difference of the polynomial $f(x) = x^4 - 12x^3 + 42x^2 - 30x + 9$ with $h = 2$.

   c) Find the real root lying between 1 and 2 of the equation $x^3 - 3x + 1 = 0$ upto 3 places of decimals by using Regula-falsi method.

6. a) Define forward difference operator.

   b) Draw backward difference table for the following data.

x :	0	10	20	30	40	50
y :	0.51	0.55	0.57	0.59	0.62	0.67

   c) If $y(75) = 246$, $y(80) = 202$, $y(85) = 118$, $y(90) = 40$, find $y(79)$.

7. a) Write Simpson's $\frac{1}{3}$ formula for numerical integration.

   b) Explain two point Gaussian quadrature formula for the numerical integration of $\int_{-1}^{1} f(x)dx$. Also generalize the result for $\int_{a}^{b} f(x)dx$.

   c) Using Simpson's $\frac{3}{8}^{th}$ rule evaluate $\int_{0}^{1} \frac{dx}{1+x}$ by taking $h = 6$.

8. a) Write Runge-Kutta fourth order formula for solving first order ordinary differential equation.

   b) What is the geometrical significance of Euler's method ?

   c) Using Euler's modified method find the value of y at $x = 0.1$ and $x = 0.2$,

   given $\frac{dy}{dx} = 1 + xy, y(0) = 2$.   (4×9=36)