

School of Computing Science and Engineering

M.Tech

Summer Term - September 2023

Time : 3 Hours

Marks : 100

Sem I - MATH5001 - ADVANCE NUMERICAL and STATISTICAL METHODS

Your answer should be specific to the question asked

Draw neat labeled diagrams wherever necessary

1. Write formula for Simpson's $\frac{1}{3}$ rd rule. K1 CO1 (5)
2. Find $\int_0^1 \frac{dx}{1+x}$ using Simpson's $\frac{1}{3}$ rd rule. K2 CO1 (5)
3. Explain standard five-point Liebman's formula for solving Laplace equation. K2 CO1 (5)
4. Solve the following equations by Crout's method: K2 CO1 (10)
 $x + y + z = 1,$
 $4x + 3y - z = 6,$
 $3x + 5y + 3z = 4$
5. Find the polynomial $f(x)$ by using Lagrange's formula and hence find $f(3)$ for K2 CO1 (10)

$x :$	0	1	2	5
$f(x) :$	2	3	12	147
6. Evaluate the double integral K3 CO2 (10)
$$I = \int_0^1 \left(\int_1^2 \frac{2xy}{(1+x^2)(1+y^2)} dy \right) dx$$

by using Simpson's rule with $h = k = 0.25$.
- 7) Apply fourth order Runge-Kutta method to find an approximate value of y for $x = 0.2$, if K3 CO2 (10)
 $\frac{dy}{dx} = x + y$, given that $y(0) = 1, h = 0.2$.

OR

- By using modified Euler's method. Find $y(1.4)$, given that $\frac{dy}{dx} = y^2 - \frac{y}{x}$ and $y(1) = 1$. K3 CO2 (10)
8. $f(x)$ is a probability density function of a random variable X and is given as K4 CO3 (15)
$$f(x) = \begin{cases} x, & 0 \leq x < 1/2 \\ c(2x-1)^2, & 1/2 < x \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

then find the value of c . Also find the mean value of X .
 9. Fit a straight line that best fits the following data: K4 CO3 (15)

x	1	2	3	4	5
y	14	27	40	55	68
 - 10) Solve the system of equations by general iterative method $x^2 + 3x + 3y = 5$, $x^2 + 3y^2 = 4$ K3 CO4 (15)
taking initial approximation $(x_0, y_0) = (0.5, 0.5)$.

OR

- Solve the following equation by Cholesky method: K3 CO4 (15)
 $2x + 2y + z = 1, 4x + 2y + 3z = 2, x + y + z = 3$