No. of Printed Pages : 5

# MCSE–004

## MASTER OF COMPUTER APPLICATIONS

## (MCA)

## Term-End Examination

## December, 2025

### MCSE-004 : NUMERICAL AND STATISTICAL COMPUTING

*Time : 3 Hours* *Maximum Marks : 100*

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***Note** : (i) Question No. **1** is compulsory.*

*(ii) Attempt any **three** questions from the rest.*

*(iii) Use of calculator is allowed.*

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1. (a) Let $a = \cdot 345 \times 10^{0}$, $b = \cdot 245 \times 10^{-3}$ and $c = \cdot 432 \times 10^{-3}$. Using 3-digit decimal arithmetic with rounding prove that $(a+b)+c \neq a+(b+c)$. 5

(b) Find out to how many decimal places the value 355/133 is accurate as an approximation to $\pi$ ? 5

(c) Obtain the smallest positive root of $x^3 - 2x - 5 = 0$, correct upto 2 decimal places. 5

(d) Compute the square root of $a$, using Newton's method. How does the error behave ? 5

(e) Estimate the missing term in the following, data is valid if it represents a polynomial of degree : 5

| *x* | *f(x)* |
|---|---|
| 1 | 3 |
| 2 | 7 |
| 3 | ? |
| 4 | 21 |
| 5 | 31 |

(f) Find the polynomial of degree $\leq 2$ with the properties P(1) = 5, P(1.5) = – 3, P(3) = 0. 5

(g) If a bank receives on an average $\lambda = 6$ bad cheques per day, what is the probability that it receives 4 bad cheques on any given day ? 5

(h) Apply Runge-Kutta fourth order method to find an approximate value of $y$ when $n = .2$, given that $y' = x + y$ with $y(0) = 1$ and $h = 0.2$. 5

2. (a) Find the smallest positive root of $x^7 + 9x^5 - 13x - 17 = 0$ using Newton-Rapson method. 10

(b) Use Gauss Elimination to solve : 10

$$10x_1 - 7x_2 = 7$$

$$-3x_1 + 2.099x_2 + 6x_3 = 3.901$$

$$5x_1 - x_2 + 5x_3 = 6$$

correct to six places of significant digits.

3. (a) From the following data estimate the value of $f(2.25)$ using forward difference formula : 10

| $x$ | $y$ |
|---|---|
| 0 | 1.0 |
| 0.5 | 3.625 |
| 1.0 | 7.000 |
| 1.5 | 11.875 |
| 2.0 | 19.00 |
| 2.5 | 29.125 |

(b) Calculate the value of the integral $\int_0^1 \frac{dx}{1+x}$ using Simpson's 3/8 rule with $h = 1/3$. 10

4. (a) Using Runge-Kutta method of order 4, find $y(0.2)$ given that $y = 3x + y/2$, $y(0) = 1$ taking $h = 0.1$. 10

(b) Calculate the forward differences for the following set of data : 10

| $x$ | $y$ |
|---|---|
| 1 | 2.105 |
| 2 | 2.808 |
| 3 | 3.614 |
| 4 | 4.604 |
| 5 | 5.857 |
| 6 | 7.451 |
| 7 | 9.467 |
| 8 | 11.985 |

5. Write short notes on any *four* of the following : 4×5=20

(a) Uniform Random Variable

(b) Inverse Transformation

(c) Least Square Estimation

(d) Residual Analysis

(e) Goodness of Fit

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