

## JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

## TEST -2 EXAMINATION- 2026

M. Tech.-II Semester (CSE-Data Science)

COURSE CODE (CREDITS): 22M1WCI231 (3)

MAX. MARKS: 25

COURSE NAME: ADVANCED COMPUTATIONAL TECHNIQUES

COURSE INSTRUCTOR: SST

MAX. TIME: 1 Hour 30 Minutes

**Note:** (a) All questions are compulsory.

(b) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems.

(c) Use of a scientific calculator is allowed.

| Q. No.   | Question                                                                                                                                                                                                                                                                                                                                                 | CO       | Marks |          |      |          |        |          |        |      |     |     |     |      |      |   |   |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------|----------|------|----------|--------|----------|--------|------|-----|-----|-----|------|------|---|---|
| Q1       | Using regula-falsi method find the root of the transcendental equation $x \log_{10} x = 1.2$ , correct to three decimal places.                                                                                                                                                                                                                          | 6        | 4     |          |      |          |        |          |        |      |     |     |     |      |      |   |   |
| Q2       | Perform only three iterations of the Gauss-Seidel method to solve the following system of linear equations:<br>$27x + 6y - z = 85$ $x + y + 54z = 110$ $6x + 15y + 2z = 72$                                                                                                                                                                              | 7        | 4     |          |      |          |        |          |        |      |     |     |     |      |      |   |   |
| Q3       | Using Newton-Gregory's forward difference formula, find the value of $f(1.2)$ , if<br><table><tr><td><math>x</math></td><td>1</td><td>1.4</td><td>1.8</td><td>2.2</td></tr><tr><td><math>f(x)</math></td><td>3.49</td><td>4.82</td><td>5.96</td><td>6.5</td></tr></table>                                                                                | $x$      | 1     | 1.4      | 1.8  | 2.2      | $f(x)$ | 3.49     | 4.82   | 5.96 | 6.5 | 8   | 4   |      |      |   |   |
| $x$      | 1                                                                                                                                                                                                                                                                                                                                                        | 1.4      | 1.8   | 2.2      |      |          |        |          |        |      |     |     |     |      |      |   |   |
| $f(x)$   | 3.49                                                                                                                                                                                                                                                                                                                                                     | 4.82     | 5.96  | 6.5      |      |          |        |          |        |      |     |     |     |      |      |   |   |
| Q4       | Using Newton's divided difference formula, evaluate $f(8)$ given:<br><table><tr><td><math>x</math></td><td>4</td><td>5</td><td>7</td><td>10</td><td>11</td><td>13</td></tr><tr><td><math>f(x)</math></td><td>48</td><td>100</td><td>294</td><td>900</td><td>1210</td><td>2028</td></tr></table>                                                          | $x$      | 4     | 5        | 7    | 10       | 11     | 13       | $f(x)$ | 48   | 100 | 294 | 900 | 1210 | 2028 | 8 | 4 |
| $x$      | 4                                                                                                                                                                                                                                                                                                                                                        | 5        | 7     | 10       | 11   | 13       |        |          |        |      |     |     |     |      |      |   |   |
| $f(x)$   | 48                                                                                                                                                                                                                                                                                                                                                       | 100      | 294   | 900      | 1210 | 2028     |        |          |        |      |     |     |     |      |      |   |   |
| Q5       | Find the polynomial $f(x)$ by using Lagrange's formula and hence find $f(3)$ for<br><table><tr><td><math>x</math></td><td>0</td><td>1</td><td>2</td><td>5</td></tr><tr><td><math>f(x)</math></td><td>2</td><td>3</td><td>12</td><td>147</td></tr></table>                                                                                                | $x$      | 0     | 1        | 2    | 5        | $f(x)$ | 2        | 3      | 12   | 147 | 8   | 5   |      |      |   |   |
| $x$      | 0                                                                                                                                                                                                                                                                                                                                                        | 1        | 2     | 5        |      |          |        |          |        |      |     |     |     |      |      |   |   |
| $f(x)$   | 2                                                                                                                                                                                                                                                                                                                                                        | 3        | 12    | 147      |      |          |        |          |        |      |     |     |     |      |      |   |   |
| Q6       | The following values of a function $f(x, y)$ are known:<br><table><tr><td><math>f(1,1)</math></td><td>10</td></tr><tr><td><math>f(2,1)</math></td><td>15</td></tr><tr><td><math>f(1,2)</math></td><td>24</td></tr><tr><td><math>f(2,2)</math></td><td>18</td></tr></table><br>Use two-dimensional interpolation to estimate the value of $f(1.5, 1.5)$ . | $f(1,1)$ | 10    | $f(2,1)$ | 15   | $f(1,2)$ | 24     | $f(2,2)$ | 18     | 8    | 4   |     |     |      |      |   |   |
| $f(1,1)$ | 10                                                                                                                                                                                                                                                                                                                                                       |          |       |          |      |          |        |          |        |      |     |     |     |      |      |   |   |
| $f(2,1)$ | 15                                                                                                                                                                                                                                                                                                                                                       |          |       |          |      |          |        |          |        |      |     |     |     |      |      |   |   |
| $f(1,2)$ | 24                                                                                                                                                                                                                                                                                                                                                       |          |       |          |      |          |        |          |        |      |     |     |     |      |      |   |   |
| $f(2,2)$ | 18                                                                                                                                                                                                                                                                                                                                                       |          |       |          |      |          |        |          |        |      |     |     |     |      |      |   |   |