

Reg. No.: .....



Y7557

Name: .....

**University of Kerala**

Fourth Semester FYUGP Degree Examination, May 2026

Skill Enhancement Courses

**MATHEMATICS****UK4SECMAT201 - Numerical Methods**

Academic Level: 200-299

**2024 Admission****Time: 1 Hour****Max. Marks: 28**

**Part A. 4 Marks ,Time 5 Minutes (Cognitive Level :Remember(RE)/Understand(UN))Objective Type 1 mark each, Answer all questions**

| Qn No. | Question                                                                                                                                              | CL | CO |
|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|
| 1      | If $f(x) = 2x + 5$ find $\Delta f(x)$ .                                                                                                               | RE | 2  |
| 2      | What is the formula used to find the next approximation in Regular Falsi Method?                                                                      | RE | 1  |
| 3      | Let $f(x)$ be a continuous function between $a$ and $b$ such that $f(a)f(b) > 0$ then we say that there is/are ..... root/roots between $a$ and $b$ . | UN | 1  |
| 4      | In Simpson's 1/3 rule, the number of subintervals must be .....                                                                                       | UN | 4  |

**Part B. 8 Marks ,Time 15 Minutes (Cognitive Level :Understand(UN)/Apply(AP))Short Answer 2 marks each, Answer all questions**

| Qn No. | Question                                                                                                                                                                    | CL | CO |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|
| 5      | Using the Bisection Method, find the root of the equation $x^3 - 2 = 0$ correct to two iterations in the interval $[1, 2]$ .                                                | UN | 1  |
| 6      | Using the Trapezoidal Rule, evaluate $\int_0^4 y dx$ for the following data:<br>$\begin{array}{c cccccc} x & 0 & 1 & 2 & 3 & 4 \\ \hline y & 1 & 3 & 5 & 7 & 9 \end{array}$ | UN | 4  |
| 7      | Distinguish between Newton's Forward Difference Formula and Newton's Backward Difference Formula.                                                                           | AP | 3  |
| 8      | Show that $\Delta^2 y_0 = y_2 - 2y_1 + y_0$ .                                                                                                                               | AP | 2  |

**Part C. 16 Marks ,Time 40 Minutes (Cognitive Level :Apply(AP)/Analyse(AN)/Evaluate(EV))Long Answer 4 marks each, Answer all questions choosing among options\* within each question**

| Qn No. | Question | CL | CO   |
|--------|----------|----|------|
| 9      | A)       | AP | 3, 3 |

| Qn No.          | Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CL           | CO     |        |        |        |     |        |                |        |        |        |        |       |       |            |    |    |    |    |     |       |                 |        |        |        |        |        |        |    |      |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------|--------|--------|--------|-----|--------|----------------|--------|--------|--------|--------|-------|-------|------------|----|----|----|----|-----|-------|-----------------|--------|--------|--------|--------|--------|--------|----|------|
|                 | <p>A function <math>y = f(x)</math> is defined as Follows</p> <table><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Y=f(x)</td><td>6.9897</td><td>7.4036</td><td>7.7815</td><td>8.1291</td><td>8.4510</td></tr></table> <p>Find <math>dy/dx</math> when <math>x = 1</math>.</p> <p>OR</p> <p>B)</p> <p>From the table below, for what value of <math>x</math>, <math>y</math> is minimum? Also find this value of <math>y</math>.</p> <table><tr><td><math>x</math></td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td><math>y</math></td><td>0.205</td><td>0.240</td><td>0.259</td><td>0.262</td><td>0.250</td><td>0.224</td></tr></table>                                                                                                                                                                                                                                                                   | X            | 0      | 1      | 2      | 3      | 4   | Y=f(x) | 6.9897         | 7.4036 | 7.7815 | 8.1291 | 8.4510 | $x$   | 3     | 4          | 5  | 6  | 7  | 8  | $y$ | 0.205 | 0.240           | 0.259  | 0.262  | 0.250  | 0.224  |        |        |    |      |
| X               | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1            | 2      | 3      | 4      |        |     |        |                |        |        |        |        |       |       |            |    |    |    |    |     |       |                 |        |        |        |        |        |        |    |      |
| Y=f(x)          | 6.9897                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 7.4036       | 7.7815 | 8.1291 | 8.4510 |        |     |        |                |        |        |        |        |       |       |            |    |    |    |    |     |       |                 |        |        |        |        |        |        |    |      |
| $x$             | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 4            | 5      | 6      | 7      | 8      |     |        |                |        |        |        |        |       |       |            |    |    |    |    |     |       |                 |        |        |        |        |        |        |    |      |
| $y$             | 0.205                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.240        | 0.259  | 0.262  | 0.250  | 0.224  |     |        |                |        |        |        |        |       |       |            |    |    |    |    |     |       |                 |        |        |        |        |        |        |    |      |
| 10              | <p>A)</p> <p>The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface:</p> <table><tr><td><math>x = height</math></td><td>:</td><td>100</td><td>150</td><td>200</td><td>250</td><td>300</td></tr><tr><td><math>y = distance</math></td><td>:</td><td>10.63</td><td>13.03</td><td>15.04</td><td>16.81</td><td>18.42</td></tr></table> <p>Find the values of <math>y</math> when <math>x = 125</math> ft.</p> <p>OR</p> <p>B)</p> <p>The following table gives the values of <math>\cos \theta</math> where <math>\theta</math> is in degrees. Using Newton's interpolation formula estimate the value of <math>\cos 53^0</math>.</p> <table><tr><td><math>\theta</math>:</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td></tr><tr><td><math>\cos \theta</math>:</td><td>0.9848</td><td>0.9397</td><td>0.8660</td><td>0.7660</td><td>0.6428</td><td>0.5000</td></tr></table> | $x = height$ | :      | 100    | 150    | 200    | 250 | 300    | $y = distance$ | :      | 10.63  | 13.03  | 15.04  | 16.81 | 18.42 | $\theta$ : | 10 | 20 | 30 | 40 | 50  | 60    | $\cos \theta$ : | 0.9848 | 0.9397 | 0.8660 | 0.7660 | 0.6428 | 0.5000 | AN | 1, 1 |
| $x = height$    | :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 100          | 150    | 200    | 250    | 300    |     |        |                |        |        |        |        |       |       |            |    |    |    |    |     |       |                 |        |        |        |        |        |        |    |      |
| $y = distance$  | :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 10.63        | 13.03  | 15.04  | 16.81  | 18.42  |     |        |                |        |        |        |        |       |       |            |    |    |    |    |     |       |                 |        |        |        |        |        |        |    |      |
| $\theta$ :      | 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 20           | 30     | 40     | 50     | 60     |     |        |                |        |        |        |        |       |       |            |    |    |    |    |     |       |                 |        |        |        |        |        |        |    |      |
| $\cos \theta$ : | 0.9848                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.9397       | 0.8660 | 0.7660 | 0.6428 | 0.5000 |     |        |                |        |        |        |        |       |       |            |    |    |    |    |     |       |                 |        |        |        |        |        |        |    |      |
| 11              | <p>A)</p> <p>Using Simpson's one-third rule, find the approximate value of <math>\int_0^1 \frac{1}{1+x^2} dx</math>.</p> <p>OR</p> <p>B)</p> <p>Evaluate <math>\int_1^7 \sin(x^2) dx</math> taking seven ordinates using Trapezoidal rule.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | EV           | 3, 3   |        |        |        |     |        |                |        |        |        |        |       |       |            |    |    |    |    |     |       |                 |        |        |        |        |        |        |    |      |
| 12              | <p>A)</p> <p>Find a real root of the equation <math>x^3 - x - 4 = 0</math> by Regula Falsi method. Carry on up to two iterations.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | CR           | 1, 1   |        |        |        |     |        |                |        |        |        |        |       |       |            |    |    |    |    |     |       |                 |        |        |        |        |        |        |    |      |

| Qn<br>No. | Question                                                                                                                                                                                         | CL | CO |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|
|           | <p>OR</p> <p>B)</p> <p>Using Newton-Raphson Method, find a real root of the equation <math>\sin x - e^{-x} = 0</math> in the interval <math>[0, 1]</math>. Carry on upto two approximations.</p> |    |    |