Name:

Enrolment No:

UPES
End Semester Examination, December 2024

Course: B.Tech. Aerospace Engineering **Semester: III**
Program: Computational Techniques **Time : 03 hrs.**
Course Code: CSEG2048 **Max. Marks: 100**

Instructions: **Compute all the answers up to three decimal places, wherever applicable.**

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Illustrate *Truncation error* and *Round Off error*.	**04**	**CO1**
Q 2	Evaluate a root lying between (3,4) of the following equation $x^3 - 8x - 4 = 0$ by Newton Raphson Methd up to third iteration.	**04**	**CO2**
Q 3	Prove that $\Delta = E - 1$.	**04**	**CO3**
Q 4	Formulate the forward difference table for the following data: x: 1, 1.1, 1.2, 1.3 y: 0.8415, 0.8912, 0.9320, 0.9636	**04**	**CO3**
Q 5	Evaluate the integral $\int_{1.2}^{1.6} \left(x + \frac{1}{x}\right) dx$ using Trapezoidal rule taking four intervals.	**04**	**CO4**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Use Gauss Elimination Method to solve the following system: $x_1 + 2x_2 + 3x_3 = 10$ $x_1 + 3x_2 - 2x_3 = 7$ $2x_1 - x_2 + x_3 = 5$	**10**	**CO1**
Q 7	Evaluate a root of the following equation $\sin(x) + \cos(x) = 1$ using Regula Falsi Method up to fourth iteration.	**10**	**CO2**

<table>
<tr><td>Q 8</td><td>Given $\frac{dy}{dx} = \frac{-y}{x+1}$, with the initial conditions $y(0.3) = 2$. Find $y(0.8)$ by Euler's Method taking the step length $h = 0.1$.</td><td>10</td><td>CO4</td></tr>
<tr><td>Q 9</td><td>(a) Find the least square fit of the curve of the form $y = a_{0+}\, a_1 x^2$ to the following data:

<table><tr><td>x</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr><tr><td>y</td><td>2</td><td>5</td><td>3</td><td>0</td></tr></table>
OR

(b) Fit a second degree parabola to the following data:

<table><tr><td>x</td><td>1</td><td>1.5</td><td>2</td><td>2.5</td><td>3</td><td>3.5</td><td>4</td></tr><tr><td>y</td><td>1.1</td><td>1.3</td><td>1.6</td><td>2.0</td><td>2.7</td><td>3.4</td><td>4.1</td></tr></table></td><td>10</td><td>CO5</td></tr>
<tr><td colspan="4">SECTION-C
(2Qx20M=40 Marks)</td></tr>
<tr><td>Q 10</td><td>(a) Find by Lagrange's formula, the interpolation polynomial which corresponds to the following data:

<table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>y</td><td>1</td><td>2</td><td>11</td><td>34</td></tr></table>
Hence, find the value of $y(1.5)$.

OR

(b)(i) Find the divided differences for equispaced arguments.

(ii) Compute $y(1.25)$ from the following table using Newton's Divided Difference formula:

<table><tr><td>x</td><td>1</td><td>1.1</td><td>1.3</td><td>1.5</td><td>1.6</td></tr><tr><td>y</td><td>0.3639</td><td>0.3258</td><td>0.2612</td><td>0.2095</td><td>0.1876</td></tr></table></td><td>20</td><td>CO3</td></tr>
<tr><td>Q 11</td><td>Given $\frac{dy}{dx} = xy$, with the initial conditions $y(0) = 2$. Find $y(0.4)$ by RK-4 Method taking the step length $h = 0.2$.</td><td>20</td><td>CO4</td></tr>
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