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Department of Research & Development
Mid - Term Examinations - SEPTEMBER 2024

Odd Semester: Ph.D. Course Work	Date: 27 /09/2024
Course Code: MAT834	Time: 2:00pm – 3:30pm
Course Name: Numerical Methods with Programming Techniques	Max Marks: 50
Department: Mathematics	Weightage: 25%

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 5 marks.		4Qx5M=20M								
1	Use Newton-Raphson method to find the root of the function $f(x) = \cos x + 2 \sin x + x^2$ correct to 3 decimal places.	5 Marks								
2	A robot arm with a rapid laser scanner is doing a quick quality check on holes drilled in a 15"×10" rectangular plate. The centers of the holes in the plate describe the path the arm needs to take, and the hole centers are located on a Cartesian coordinate system (with the origin at the bottom left corner of the plate) given by the specifications in the following table. If the laser is traversing along the x-direction, what is the value of y at $x=10.00$ using appropriate method	5 Marks								
<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td> <td>5</td> <td>6</td> <td>9</td> </tr> <tr> <td>Y</td> <td>12</td> <td>13</td> <td>14</td> </tr> </table>		X	5	6	9	Y	12	13	14	
X	5	6	9							
Y	12	13	14							
3	Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ by using Simpson's 1/3 rd and 3/8 th rules.	5 Marks								
4	Find the $y(25)$ given that $y_{20} = 24, y_{24} = 32, y_{28} = 35, y_{32} = 40$ using gauss forward difference formula.	5 Marks								

Part B

Answer ALL Questions. Each question carries 15 marks.		2QX15M=30M
5	Using finite difference method find $y(0.25), y(0.5)$ and $y(0.75)$ satisfying the difference equation $\frac{d^2y}{dx^2} + y = x$ subject to the boundary condition $y(0) = 0 ; y(1) = 2$.	15 Marks

6	Apply 4th order Runge - Kutta Method to solve the following IVP at $x = 0.3$ $\frac{dy}{dx} = \frac{y-x}{y+x}; y(0) = 1 \& h = 0.1.$	15 Marks
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