Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III EXAMINATION – SUMMER 2025

Subject Code:3130107 Date:13-06-2025

Subject Name: Partial Differential Equations and Numerical Methods

Time:02:30 PM TO 05:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	State the Simpson rule for numerical integration.	**03**
	(b)	State and describe the formula for Picard's method	**04**
	(c)	Implement the method of least square to fit a second-degree curve $y = a_0 + a_1x + a_2x^2$ for the following data	**07**

x	1	1.5	2	2.5	3.0	3.5	4.0
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

Q.2	**(a)**	Solve z=(x+a)(y+b)	**03**
	(b)	Evaluate using method of successive approximation for the function $sinx = \frac{x}{2}$	**04**
	(c)	Find a real root for the function using Newton Raphson method correct upto three iterations places $f(x) = cosx - 3x - 1\ using\ \ x_0 = 0$	**07**
		OR	
	(c)	Given that the equation $x^3 - 2x - 5 = 0$ has a root between 2 and 3 use Regula-Falsi method to find it.	**07**
Q.3	**(a)**	State the backward interpolation formula	**03**
	(b)	Find the polynomial corresponding to the data	**04**

x	0	1	2	3	4	5
y	-10	-8	-8	-4	10	40

	(c)	Evaluate using Trapezoidal and Simpson 1/3rd rule $\int_0^1 \frac{1}{1+x} dx$ h=0.25	**07**
		OR	
Q.3	**(a)**	Brief the Inverse Lagrange's interpolation formula	**03**
	(b)	Apply Simpson's 1/3rd rule to evaluate $\int_0^{0.3} \sqrt{1 - 8x^3} dx\ \ with\ \ h = 0.075$	**04**
	(c)	Use appropriate Newtons interpolation formula to compute y(1.6) from the table	**07**

x	1	1.4	1.8	2.2
y	3.49	4.82	5.96	6.5

Q.4	**(a)**	State successive approximation formula for IVP	**03**
	(b)	Solve (y+z)p-(x+z)q=x-y	**04**
	(c)	Describe the Runge Kutta 4th order method and use it to solve $\frac{dy}{dx} = \frac{y-x}{y+x}, y(0) = 1$ compute y for x=1	**07**
		OR	
Q.4	**(a)**	State the algorithm of successive approximation	**03**
	(b)	Solve $z^2(p^2z^2 + p^2a^2) = 1$	**04**
	(c)	Solve using Taylors series method $y'' - xy' - y = 0, y(0) = 1$ and determine y(0.1)	**07**
Q.5	**(a)**	Solve z=px+qy+pq	**03**
	(b)	Solve $(D^2 + 10DD' + 25D'^2)z = e^{3x+2y}$	**04**
	(c)	Solve partial differential equation using variable separable method $u_{xx} = a^2u$	**07**
		OR	
Q.5	**(a)**	Solve $\left(D^2 - 3DD' + 2D'^2\right) = 0$	**03**
	(b)	Solve to obtain the particular integral for $4r + 12s + 9t = e^{3x-2y}$	**04**
	(c)	A tightly stretched string with fixed ends x=0 and x=L is initially in a position given by $u(x, 0) = u_0 sin^3(\frac{\Pi x}{L})$. If it is released at rest from this position, find the displacement u(x.t).	**07**

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