Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–III (NEW) EXAMINATION – WINTER 2024

Subject Code: 3130107 Date: 21-11-2024

Subject Name: Partial Differential Equations and Numerical Methods

Time: 10:30 AM TO 01:00 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 definition for Ef(x) and prove $\Delta = E - 1$.	**03**
	(b)	State and describe the formula for Trapezoidal rule	**04**
	(c)	Implement the method of least square to fit a straight line $y = ae^{bx}$ the following data	**07**

x	1	2	3	4
y	7	11	17	27

Q.2	**(a)**	Solve $(y+z)p - (x+z)q = x - y$	**03**
	(b)	Evaluate using method of successive approximation for the function $sinx = \frac{x}{2}$	**04**
	(c)	Find a root for the function $\sqrt{N}$ using Newton Raphson also compute for N=27	**07**
		OR	
	(c)	Use bisection method to solve $x^3 - x - 11 = 0$ $upto\ fourth\ iteration.$	**07**
Q.3	**(a)**	State the forward interpolation formula	**03**
	(b)	Find the polynomial corresponding to the data	**04**

x	-1	0	2	3
y	-2	-1	1	4

	(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 Trapezoidal rule to evaluate $\int_0^1 e^{-x^2} dx \ \ with \ \ n = 10$	**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 Taylor's approximation formula for IVP	**03**
	(b)	State the Runge Kutta fourth order formula	**04**
	(c)	Use the Taylors method to solve $\frac{dy}{dx} = 2y + 3e^x, y(0) = 0$ compute y for x=0.2	**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 4z=pq	**03**
	(b)	Solve $(D^2 + 10DD' + 25D'^2)z = e^{3x+2y}$	**04**
	(c)	Solve heat equation using variable separable method	**07**
		OR	
Q.5	**(a)**	State the wave equation with initial and boundary conditions	**03**
	(b)	Solve $p^2 + x^2y^2q^2 = x^2z^2$	**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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