GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III (New) EXAMINATION – WINTER 2019

Subject Code: 3130107   **Date: 26/11/2019**

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.**

			Marks
Q.1	**(a)**	Discuss in brief least square method for straight line	**03**
	(b)	Fit a straight line to	**04**

x	1	2	3	4	5
y	14	27	40	55	68

	(c)	State the method of false position and solve $x^3 - 2x - 5 = 0$	**07**
Q.2	**(a)**	Apply Newton Raphson to solve $x \sin x + \cos x = 0, \quad x_0 = 3.1416$	**03**
	(b)	Solve using Gauss elimination method $5x - 2y + 3z = 18$ $x + 7y - 3z = -22$ $2x - y + 6z = 22$	**04**
	(c)	Find the value of y when x=390 using Newtons formula from the table	**07**

x	100	150	200	250	300	350	400
y	10.63	13.03	15.04	16.81	18.42	19.9	21.47

OR

	(c)	Use Lagranges formula to obtain y for x=2 using,	**07**

x	0	1	3	4
y	-12	0	6	12

Q.3	**(a)**	Apply Trapezoidal rule to evaluate $\int_{1}^{5} \log_{10} x \, dx$ with h=0.5.	**03**
	(b)	State the formula for Secant method	**04**
	(c)	Apply Runge kutta 4th order method to solve $\frac{dy}{dx} = y - \frac{2x}{y}, \quad y(0) = 1.$ Compute value for y(0.4) and y(0.5).	**07**

OR

Q.3	**(a)**	Apply the Simpson 3/8 rule $\int_{0}^{1} \frac{1}{1+x} \, dx$ with h=0.25	**03**
	(b)	State the formula for Cubic spline interpolation	**04**

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(c) State the Picard's method to solve   **07**

$\dfrac{dy}{dx} = x + y^2$ subject to condition y=1,x=0.

Q.4 **(a)** State the classification of partial differential equation.   **03**

(b) Solve pq=k   **04**

(c) Solve 1) $2r + 5s + 2t = 0$ and 2) $y^2 p + x^2 q = x^2 y^2 z^2$ **07**

OR

Q.4 **(a)** State the parabolic equation with initial conditions   **03**

(b) Solve $p^2 + q^2 = m$ **04**

(c) Solve one dimensional heat equation   **07**

$\dfrac{\partial u}{\partial t} = c^2 \dfrac{\partial^2 u}{\partial x^2}$ $\quad with \quad u(0,t) = 0$

$u(L,t) = 0 \quad and \quad u(x,0) = f(x)$

Q.5 **(a)** State the Taylors series formula to solve initial value problem.   **03**

(b) Solve $2\dfrac{\partial^2 z}{\partial x^2} + 5\dfrac{\partial^2 z}{\partial x \partial y} + 2\dfrac{\partial^2 z}{\partial y^2} = 0$ **04**

(c) State the methods to solve linear partial differential equations and solve $(mz - ny)\dfrac{\partial z}{\partial x} + (nx - lz)\dfrac{\partial z}{\partial y} = ly - mx$ **07**

OR

Q.5 **(a)** Give the formula for Newton's backward interpolation formula   **03**

(b) Solve $px(x + y) = qy(x + y) - (x - y)(2x + 2y + z)$ **04**

(c) Using Lagrange interpolation formula form a polynomial for,   **07**

X	2	2.5	3
y	0.69315	0.91629	1.09861

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