Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– II(Old course) • EXAMINATION (Remedial) – WINTER- 2015

Subject Code: 1720110 **Date: 15/12/2015**

Subject Name: Numerical Methods

Time:2:30 pm to 5:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Discuss the absolute and relative errors in numerical computations and find the absolute and relative errors in computations of $S = \sqrt{3} + \sqrt{5} + \sqrt{7}$ to 4 significant digits. **07**

(b) Find one root of $x^3 - 4x - 8.95 = 0$ correct to three decimal places using the method of Bisection. **07**

Q.2 **(a)** Fit the best equation of line $y = a + bx$ for the following data: **07**

x	0	2	5	7
y	-1	5	12	20

And hence find y at $x = 5$.

(b) Use Newton-Raphson method to find the real root near 2 of the equation $x^4 - 11x + 8 = 0$ accurate to five decimal places. **07**

OR

(b) Using the method of False Position, find the real root of the equation $cosx - 3x + 5 = 0$ accurate to four decimal places. **07**

Q.3 **(a)** Solve the following equations by Gauss elimination method: **07**

$x + 3y + 2z = 17, x + 2y + 3z = 16, 2x - y + 4z = 13.$

(b) Using Lagrangeôs interpolation formula find a polynomial which passes the points (0,-20), (1,-12), (3,-20), (4,-24). **07**

OR

Q.3 **(a)** Solve the following equations correct to three decimal places by Gauss-Seidal method: **07**

$x + 2y + z = 0,\ 3x + y - z = 0,\ x - y + 4z = 3.$

(b) Find the inverse of the matrix $A = \begin{bmatrix} 3 & 1 & 2 \\ 2 & -3 & -1 \\ 1 & 2 & 1 \end{bmatrix}$ and also solve the system of equations $AX = B$, where $= \begin{bmatrix} 3 \\ -3 \\ 4 \end{bmatrix}$. **07**

Q.4 **(a)** Evaluate the integral $\int_0^{12} \frac{dx}{1+x^2}$, taking six intervals by using trapezoidal rule upto three significant figures. **07**

(b) Evaluate the integral $\int_0^{1.2} e^x dx$, by using Simpsonôs 1/3 rule up to three significant figures. **07**

OR

Q.4	**(a)**	Evaluate the integral $\int_2^6 \log_{10} x \, dx$, taking six intervals by using trapezoidal rule upto three significant figures.	**07**
Q.4	**(b)**	Evaluate the integral $\int_0^1 \frac{dx}{1+x}$, by using Simpsonôs 3/8 rule.	**07**
Q.5	**(a)**	Apply Eulerôs method to approximate the solution of the initial value problem $\frac{dy}{dt} = -ty^2 , y(2) = 1$ with in the interval $2 < t < 2.5$, using h = 0.1.	**07**
	(b)	Use the Runge-Kutta method of order two with h = 0.1 on (0,0.3) for the initial problem $\frac{dy}{dx} = \sin y , y(0) = 1.$	**07**

OR

Q.5	**(a)**	Apply Modified Eulerôs method to approximate the solution of the initial value problem $\frac{dy}{dx} = 2xy , y(1) = 1$ with in the interval $1 < x < 1.5$, using h = 0.1.	**07**
	(b)	Use the Runge-Kutta method of order four with h = 0.2 on (0,0.8) for the initial problem $\frac{dy}{dx} = \sqrt{x+y}, y(0.4) = 0.41.$	**07**

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