Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2013

Subject code: 1720110 **Date: 07-06-2013**

Subject Name: Numerical Methods

Time: 10.30 am – 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.**

Q.1 **(a)** Solve using Newton Raphson method $x^3 + 2x^2 + 10x - 20 = 0$ **7**

(b) Explain different types of Errors with suitable examples **7**

Q.2 **(a)** Solve using gauss elimination method to solve the equations: 2x + y + z = 10, 3x + 2y +3z = 18, x + 4y + 9z = 16. **7**

(b) Solve the following equations by Gauss- seidel iteration correct method upto 3 significant digits. **7**

$20x_1 + 2x_2 + x_3 = 30$

$x_1 - 40x_2 + 3x_3 = -75$

$2x_1 - x_2 + 10x_3 = 30$

OR

(b) Write program for matrix Inversion. **7**

Q.3 **(a)** Given that $\frac{dy}{dx} = x + y^2$, y(0) = 1. Using Runge- Kutta fourth order method find approximate value of y(0.2), take step-size 0.1 **7**

(b) A train is moving at speed of 30m/sec. suddenly brakes are applied. The speed of the train per second after t seconds is given by the below table. Apply Simpsonôs three-eighth rule to determine the distance moved by the train in 30 seconds **7**

Time(t)	0	5	10	15	20	25	30
Speed(y)	30	24	19	16	13	11	10

OR

Q.3 **(a)** Use Runge Kutta second order method to approximate y when x= 0.8 with $\frac{dy}{dx} = \sqrt{x+y}$, $x_0 = 0.4$ and $y_0 = 0.41$ **7**

(b) Evaluate the integral using simpsonôs one-third rule. $\int_0^1 (4x - 3x^2)dx$, taking n=10. **7**

Q.4 **(a)** Use Eulersôs method to find an approximate value of y at x=0.1 in five steps, given that $\frac{dy}{dx} = x - y^2$ and y(0) = 1. Take $x_0 = 0$. **7**

(b) Using Lagrangeôs formula, find the values of f(0) on the table given below. **7**

x:	-1	-2	2	4
f(x):	-1	-9	11	69

OR

Q.4 **(a)** Use modified Eulerôs method to find the solution in the interval [1,1.5] using step size h=0.1 for $\frac{dy}{dx}$ = xy with y(1) = 5. **7**

(b) Fit cubic spline and evaluate y(1.5) **7**

x:	X0= 1	X1= 2	X2= 3	X3= 4
y:	Y0= 1	Y1= 2	Y2= 5	Y3= 11

Q.5 **(a)** Evaluate $\int_1^5 \log_{10} x \, dx$, taking 8 subintervals, correct to four decimal places by Trapezoidal method. **7**

(b) If P is the pull required to lift a load W by means of pulley block, find a linear law of form P=mW+c connecting P and W using below given data where P and W are taken in kg-wt. Compute P when W= 200 kg. **7**

P:	12	15	21	25
W:	50	70	100	120

OR

Q.5 **(a)** Explain and derive Trapezoidal rule for numerical integration. **7**

(b) Given a table of values for the function. Fit the second degree polynomial **7**

x:	1.0	1.5	2.0	2.5	3.1	4.0
y:	1.1	1.3	1.6	2.0	3.4	4.2

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