Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 711507N **Date: 06-01-2014**

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 mark.**

Q.1 **(a)** Solve using Regula Falsi method $x\log_{10}x - 1.2 = 0$ correct to 4 decimal places. **7**

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

Q.2 **(a)** Solve using Jacobi's method to solve the equations: 20x + y - 2z - 17 = 0, 2x - 3y + 20z -25 = 0, 3x + 20y - z + 18= 0. **7**

(b) Solve the following equations by Gauss- seidel iteration correct method upto 4 significant digits. **7**

$10x_1 + x_2 + 2x_3 = 44$

$2x_1 + 10x_2 + x_3 = 51$

$x_1 + 2x_2 + 10x_3 = 61$

OR

(b) Write program for Newton Raphson Method. **7**

Q.3 **(a)** Compute y for x= 0.2 given that $\frac{dy}{dx} = y - \frac{2x}{y}$, y(0) = 1. Using Runge- Kutta fourth order method, take step size as 0.2. **7**

(b) Following table shows speed in m/s and time in second a car. Using Simpson's one third rule find the distance travelled by the car in 120 second. **7**

t	0	12	24	36	48	60	72	84	96	108	120
V	0	3.60	10.08	18.90	21.60	18.54	10.26	5.40	4.50	5.40	9.00

OR

Q.3 **(a)** Use Runge Kutta second order method to approximate y when x= 1.1 given that y=1.2 when x=1 and $\frac{dy}{dx} = 3x + y^2$. **7**

(b) Evaluate the integral using simpson's one-third rule. $\int_0^{\pi} \sin x \, dx$, divide the range into 10 equal parts in such a way that x will be 0, $\frac{\pi}{10}, \frac{2\pi}{10}, \frac{3\pi}{10}$ and so on. **7**

Q.4 **(a)** Use Eulers's method to find solution correct upto 3 decimal position in interval [1,1.5] using step size h = 0.1, given that $\frac{dy}{dx}$ = xy with y(1)= 5 **7**

(b) Given the table of values. Find x(0.390) using lagrangian formula. **7**

x:	20	25	30	35
y(x):	0.342	0.423	0.500	0.650

OR

Q.4 **(a)** The table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface. Find the value of y when x= 390 ft. **7**

Height(x)	100	150	200	250	300	350	400
Distance(y)	10.63	13.03	15.04	16.81	18.42	19.90	21.27

(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 $\int_1^2 e^{\frac{-1}{2}x}\, dx$ taking 4 subintervals, correct to three decimal places by Trapezoidal method. **7**

(b) A simply supported beams carries a concentrated load P at its mid-point. Corresponding to various values of P the maximum deflection Y is measured and is given below. Find a law of the form Y= a + bP and hence estimate Y when P = 150. **7**

P:	100	120	140	160	180	200
Y:	0.45	0.55	0.60	0.70	0.80	0.85

OR

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

(b) Given a table of values for the function. Determine both the regression lines, and also find their intersection point. **7**

x:	10.1	0.2	0.3	0.4	0.5	0.6
y:	5.1	5.3	5.6	5.7	5.9	6.1

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