Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –II Examination Dec. - 2011

Subject code: 1720110 **Date: 19/12/2011**

Subject Name: Numerical methods

Time: 02.30 pm – 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.**

Q.1 **(a)** Discuss in detail Newton-rapson method for solution of an equation with suitable example. **07**

(b) Write and explain in detail the computer program of Runge-Kutta 2nd order method for solution of ordinary differential equation. **07**

Q.2 **(a)** Apply Gauss elimination method to solve the equations x+3y-2z=5,2x+y-3z=1,3x+2y-z=6 **07**

(b) Solve the following equations by Gauss-Seidel method. 15x+y+z=17,2x+15y+z=18,x+2y+15z=18. **07**

OR

(b) Write and explain algorithm for matrix inversion. **07**

Q.3 **(a)** Explain and derive trapezoidal rule for numerical integration. **07**

(b) Given e0=1,e1=2.72,e2=7.39,e3=20.09,e4=54.60, find an approximation value of $\int_0^4 e^x \, dx$ by Simpson's one-third rule. **07**

OR

Q.3 **(a)** Explain and derive Simpson's one-third rule. **07**

(b) Given e0=1,e1=2.72,e2=7.39,e3=20.09,e4=54.60, find an approximation value of $\int_0^4 e^x \, dx$ by Trapezoidal rule. **07**

Q.4 **(a)** Explain Euler's method and derive equation for the same. **07**

(b) Fit a straight line to the following data: **07**

x:	0	1	2	3	4	5
y:	1	2	3	4.5	6	7.5

OR

Q.4 **(a)** Write and explain algorithm for modified Euler's method. **07**

Q.4 **(b)** Fit a straight line to the following data: **07**

x:	100	120	140	160	180	200
y:	0.45	0.55	0.60	0.70	0.80	0.85

Q.5 **(a)** Explain the following with suitable examples **07**

(i) Significant digits

(ii) Machine epsilon

(b) Kirchhoff's rules can be used to express the impedance of the system as **07**

$$\frac{1}{Z} = \sqrt{\frac{1}{R^2} + (wC - 1/wL)^2}$$

Where Z=impedence(Ω) and w=the angular frequency. Find the w that results in an impedance of 75 Ω using bisection method with initial guesses of 1 and 1000 for the following parameters:
R=225Ω,C=0.6×10^{-6}F, and L=0.5H

OR

Q.5 **(a)** Explain the following with suitable examples **07**

(i) Different types of error.

(b) Kirchhoff's rules can be used to express the impedance of the system as **07**

$$\frac{1}{Z} = \sqrt{\frac{1}{R^2} + (wC - 1/wL)^2}$$

Where Z=impedence(Ω) and w=the angular frequency. Find the w that results in an impedance of 75 Ω using False position method with initial guesses of 1 and 1000 for the following parameters:
R=225Ω,C=0.6×10^{-6}F, and L=0.5H

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