Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-II Remedial Examination December 2010

Subject code: 720110 **Subject Name: Numerical Methods**

Date: 23 /12 /2010 **Time: 02.30 pm – 05.00 pm**

Total Marks: 60

Instructions:

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

Q.1 **(a)** (i) What are the different types of errors in numerical analysis? Explain with suitable example to each of them. **06**

(ii) Find cubic polynomial f(x) for which

x:	0	1	2	4
f(x):	1	1	2	5

(b) **06**

(i) Calculate $\int_0^{\frac{\Pi}{2}} e^{\sin x}\, dx$ by Simpson's -3/8 rule.

(ii) Round of number 0.76029 and 2.36425 correct to four Significant number. Calculate absolute and relative error.

Q.2 **(a)** What do you mean by algebraic and transdental equation. Explain Newton's-Raphson method to find root of an equation f(x) = 0. **06**

(b) Find the root of an equation x^2-5x + 3 = 0 by bisection method for four decimal places. **06**

OR

(b) Find the root of equation $x.e^x = \cos x$ using the Regula-Falsi method. correct to four decimal places. **06**

Q.3 **(a)** Solve $y' = 3x^2 + y$ in $0 \le x \le 1$ by Euler's method taking h=0.1 given that y(0) = 4. **06**

(b) Explain Gauss elimination method for finding solution of non-homogeneous system of linear equations. **06**

OR

Q.3 **(a)** Describe Euler's method and Range Kutta method 4^{th} to solve numerically ordinary differential equation. **06**

(b) **06**

Find the inverse of $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ by Gauss Jordan method.

Q.4 **(a)** Explain interpolation and derive Newton's divided difference interpolation formula. **06**

(b) Fit a second degree parabola to the following data by Least Square method. **06**

x:	1	2	3	4	5	6	7	8	9
y:	2	6	7	8	10	11	11	10	9

OR

Q.4 **(a)** Write C++ program for Langrange's formula for interpolation. **06**

(b) Solve ODE $y' = x^2 + y$, y = 3 when x = 0 using modified Euler's method. Compute y(0.02) and y(0.04). **06**

Q.5 **(a)** Explain numerical integration and derive Simpson's -3/8 rule to evaluate definite integration. **06**

(b) Evaluate $\int_2^4 (x^2 + 2x)\,dx$ by using Gauss Quadrature formula for three points. **06**

OR

Q.5 **(a)** Derive Trapezoidal rule and Simpson's -1/3 rule to evaluate definite integration. **06**

(b) **06**

(i) Evaluate $\int_0^4 e^x\,dx$ by Simpson's -1/3 rule.

(ii) Given $y' = 1 + y^2$ with $y = 0$ when $x=0$, find $y(0.2)$ and $y(0.4)$ by Range-Kutta 4^{th} order.

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