

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. Sem. – IInd - Examination – June/July- 2011
Subject code: 1722309
Subject Name: Numerical Methods

Date: 01/07/2011

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) Evaluate the value of square root of 19 correct to three decimal places using Newton-Raphson method. **07**
- (b) The following system of equations was generated by applying the mesh current law to the circuit. **07**
- $55I_1 - 25I_4 = -200$
 $-37I_3 - 4I_4 = -250$
 $-25I_1 - 4I_3 + 29I_4 = 100$
Solve for I_1 , I_3 and I_4 . Using Matrix inversion method.
- Q-2** (a) Write a well commented program for modified Euler method. **07**
- (b) Differentiate between the following with a suitable example. **07**
- (a) Initial value and boundary value problems
(b) Ordinary and partial derivatives
(c) Ordinary and partial differential equations
- OR
- (b) Find the solution of the following differential equation **07**
- $\frac{dy}{dx} = x^2 + y$
Using Runge-Kutta second order method for $x=0.1, 0.2, 0.3$ and 0.4 .
Given that $y=1$ when $x=0$.
- Q-3** (a) Explain Cubic Spline in detail with a suitable example. **07**
- (b) Find the root of equation **07**
- $\cos x - 3x + 1 = 0$
Correct to three decimal positions using False position method.
- OR
- Q-3** (a) One real root of the equation $e^{-x} - x = 0$ lies between 0 and 1. Find the root with tolerance 0.001 using bisection method. **07**
- (b) Explain algorithm for Gauss Elimination Method in detail. **07**

Q-4 (a) Find the RMS value for **07**

$$i(t) = 5e^{-1.25t} \sin 2\pi t \quad \text{for } 0 \leq t \leq T/2$$
$$i(t) = 0 \quad \text{for } T/2 < t \leq T$$

Where $T=1s$.

Use Trapezoidal rule with five segments.

(b) **07**

Evaluate $\int_{-2}^2 3x/(4+x)^2 dx$ using Simpson's $1/3^{rd}$ rule with

Six Intervals.

OR

Q-4 (a) Find the RMS value for **07**

$$i(t) = 5e^{-1.25t} \sin 2\pi t \quad \text{for } 0 \leq t \leq T/2$$
$$i(t) = 0 \quad \text{for } T/2 < t \leq T$$

Where $T=1s$.

Use Simpson's $1/3$ rule with five segments.

(b) **07**

Evaluate $\int_1^2 4e^x dx$ using Simpson's $1/3^{rd}$ rule with six

Intervals.

Q-5 (a) Explain following terms with suitable examples **07**

- (a) Data Errors
- (b) Truncation Errors
- (c) Round-off Errors
- (d) Computational Error
- (e) Absolute Error
- (f) Relative Error

(b) Derive formula for Lagrangian polynomial and Lagrangian inverse polynomial. **07**

OR

Q-5 (a) Derive a formula for Fitting A Straight Line for given points using least squares principal. **07**

(b) Given a table of values for the function as **07**

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

Fit a second degree polynomial.
