Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER II (OLD) – • EXAMINATION – SUMMER 2016

Subject Code: 1720110 Date:21/05/2016

Subject Name: Numerical Methods

Time:10:30 am to 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)** Define different types of errors with suitable illustration. **07**

(b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal rule taking $h=\frac{1}{4}$ **07**

Q.2 **(a)** Compute 7 iterations of bisection method to find the approximate root of the equation $\sin x = \frac{1}{x}$ in the interval $(1,1.5)$. **07**

(b) Discuss pitfalls of Gauss Elimination Method. How it can be improved? **07**

OR

(b) A river is 80 ft wide. The depth d in feet at a distance x feet from one bank is given by the following table: **07**

x	0	10	20	30	40	50	60	70	80
d	0	4	7	9	12	15	14	8	3

Find approximately the area of the cross – section.

Q.3 **(a)** Solve the following system of equations using Gauss elimination method **07**

$$20x+y-2z=17$$
$$2x-3y+20z=25$$
$$3x+20y-z=-18$$

(b) Use Lagrange's formula to find $f(x)$, given that **07**

x	0	2	3	6
$f(x)$	648	704	729	792

OR

Q.3 **(a)** Find the solution of following system of equation correct to 3 decimal places using Gauss – Seidel method: **07**

$$27x+6y-z=85$$
$$x+y+54z=110$$
$$6x+15y+2z=72$$

(b) Using Euler's method find the approximate value of y for $x=0.1$, given that **07**

$$\frac{dy}{dx}=\frac{y-x}{y+x}, y(0)=1.$$

Q.4 **(a)** Find the solution of following system of equation correct to 3 decimal places **07**

Compute the value of $\int_0^1 \frac{x^2}{1+x^3}dx$ using Simpson's 1/3rd rule.

(b) To the following data fit a curve of the form $y=ae^{bx}$: **07**

x	0	1	2	3
y	1.05	2.10	3.85	8.30

OR

Q.4 **(a)** Find the inverse of the following matrix using Gauss Jordan method: **07**

$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$$

(b) Fit a second degree parabola to the following data: **07**

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

Q.5 **(a)** Use Simpson's 1/3rd rule to evaluate $\int_0^{0.6} e^{-x^2} dx$ taking $h = 0.1$ **07**

(b) Using modified Euler's method, find $y(0.2)$ given $y' = y + e^x, y(0) = 0$. **07**

OR

Q.5 **(a)** Evaluate $\int_0^{\pi/2} e^{\sin x} dx$ correct to 4 decimal places, by Simpson's 3/8th rule. **07**

(b) Find approximate value of y at $x = 1.2$ from $\frac{dy}{dx} = \frac{2xy + e^x}{x^2 + xe^x}, y(1) = 0$ **07**

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