Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2015**

**Subject Code: 2140706 Date:30/05/2015**

**Subject Name: Numerical and Statistical methods for Computer Engineering**

**Time:10:30am-1.30pm 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)** (i) Discuss briefly the various types of errors in performing numerical calculations. **04**

(ii) Define ill-conditional and well conditional of linear equations. **03**

**(b)** The population of the town is given below. Estimate the population for the year 1895 and 1930 using suitable interpolation. **07**

| year | 1891 | 1901 | 1911 | 1921 | 1931 |
|---|---|---|---|---|---|
| Population in thousand | 46 | 66 | 81 | 93 | 101 |

**Q.2** **(a)** Derive Newton- Raphson method in brief. **07**

**(b)** Find positive root of an equation $x^3 + x^2 - 1 = 0$ by iteration method correct to four decimal places. **07**

**OR**

**(b)** Find smallest positive root of an equation $x - e^{-x} = 0$ using Regula Falsi method correct to four significant digits. **07**

**Q.3** **(a)** By Gauss Seidel method solve the following system **07**

$2x + y + 6z = 9$

$8x + 3y + 2z = 13$

$x + 5y + z = 7$

**(b)** Fit a second degree polynomial using least square method to data given below **07**

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Y | 1 | 1.8 | 1.3 | 2.5 | 6.3 |

**OR**

**Q.3** **(a)** Solve the following equations using Gauss Elimination **07**

$x + y + 2z = 4$

$3x + y - 3z = -4$

$2x - 3y - 5z = -5$

**(b)** Obtain the cubic splines for the first two subinterval to following data **07**

| x | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| y | 1 | 2 | 5 | 11 |

**Q.4** **(a)** (i)Write an algorithm for simpson's 3/8 rule to integrate the tabulated function. **04**

(ii) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ using Trapezoidal rule. **03**

**(b)** Solve initial value problem $\frac{dy}{dx} = x\sqrt{y}$, y(1) =1 and hence find y(1.5) by taking h = 0.1 using Euler's method. **07**

**OR**

**Q.4** **(a)** (i)Write an algorithm for Lagrange's interpolation method to find functional value. **04**

(ii) Construct Divided difference table for the data given below **03**

| x | -4 | -1 | 0 | 2 | 5 |
|---|---|---|---|---|---|
| f(x) | 1245 | 33 | 5 | 9 | 1335 |

**(b)** Solve boundary value problem $\frac{d^2y}{dx^2} = \frac{dy}{dx}$, y(0) = 0 and y(1) =1.17 **07**

**Q.5** **(a)** Develop a C program of Runge-Kutta second order method to solve ordinary differential equation. **07**

**(b)** Obtain the two regression lines from the following data and hence find the correlation coefficient. **07**

| x | 6 | 2 | 10 | 4 | 8 |
|---|---|---|---|---|---|
| y | 9 | 11 | 5 | 8 | 7 |

**OR**

**Q.5** **(a)** Develop a C program to fit regression line x on y through set of points using method of least squares. **07**

**(b)** Assume a four yearly cycle and calculate trend by method of moving averages from the following data relating to the production in pen drives in India. **07**

| Year | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Production (million kgs) | 464 | 515 | 518 | 467 | 502 | 540 | 557 | 571 | 586 | 612 |

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