

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-V EXAMINATION – WINTER 2015

Subject Code: 151601**Date: 15/12/2015****Subject Name: Computer Oriented Statistical Methods****Time: 10:30am to 1:00pm****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 absolute error, relative error, truncation error and round off error. **07**

Evaluate the sum $s = \sqrt{3} + \sqrt{5} + \sqrt{7}$ to four significant digits and find its absolute and relative error.

(b) (1) What is normalized floating point representation of numbers? Discuss its arithmetic operations with examples. **04**

(2) Explain ill conditioned system of the linear equation. **03**

Q.2 (a) Find all the roots of the equation $x^3 - x^2 - 17x - 15 = 0$ by Graffe's root squaring method with four time squaring. **07**

(b) (1) Discuss convergence of newton Raphson method. **03**

(2) Find the root of the equation $\cos x - 3x + 2 = 0$, lying between 0 and 1 correct to 3 places of decimals, using iterative method. **04**

OR

(b) Extract the quadratic factor of the form $x^2 + px + q$ from the polynomial $x^4 - 3x^3 - 4x^2 - 2x + 8$, using Bairstow method and assuming that $p_0 = 1.5$ and $q_0 = 1.5$. **07**

Q.3 (a) (1) Find the value of x when y = 0.3 by applying Lagrange's inversion formula **04**

| | | | |
|----|--------|--------|--------|
| x: | 0.4 | 0.6 | 0.8 |
| y: | 0.3683 | 0.3332 | 0.2897 |

(2) Find the pressure at temperature $t = 175^\circ\text{C}$ from the following steam table using proper interpolation formula **05**

| | | | | | |
|--------------------------------|-------|-------|-------|-------|--------|
| Temp ⁰ C: | 140 | 150 | 160 | 170 | 180 |
| Pressure kgf/cm ² : | 3.685 | 4.854 | 6.302 | 8.076 | 10.225 |

(b) Fit a curve of type $y = ax^b$ for the following data: **05**

| | | | | | | |
|----|------|-------|-------|-------|-------|-------|
| x: | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 |
| y: | 0.01 | 0.405 | 0.693 | 0.916 | 1.098 | 1.252 |

OR

Q.3 (a) Obtain cubic spline for every subinterval, given in the tabular form **07**

| | | | | |
|----|---|---|----|-----|
| x: | 0 | 1 | 2 | 3 |
| y: | 1 | 2 | 33 | 244 |

(b) Solve the following system of equations by Gauss Seidel method correct to four decimal places: $x + y + 54z = 110$, $27x + 6y - z = 85$, $6x + 15y + 2z = 72$. **07**

- Q.4 (a)** Find the rate of growth of the population in 1941 and 1971 from the given data: **07**

| | | | | | |
|------------------------------|-------|-------|-------|--------|--------|
| Year (x): | 1931 | 1941 | 1951 | 1961 | 1971 |
| Population in thousands (y): | 40.62 | 60.80 | 79.95 | 103.56 | 132.65 |

- (b)** Derive trapezoidal rule. Evaluate **07**

$$\int_0^{0.6} e^x dx$$

Taking $n = 6$, correct to five significant digits by Simpson's $1/3^{\text{rd}}$ rule.

OR

- Q.4 (a)** Use Runge-Kutta 4^{th} order method to approximate y when $x = 0.2$ given that **07**

$y = 1$ when $x = 0$ and $dy/dx = x + y$

- (b)** Apply Taylor's series method to find the value of $y(1.1)$ and $y(1.2)$ correct to three decimal places given that $dy/dx = xy^{1/3}$, $y(1) = 1$. **07**

- Q.5 (a)** Find the two lines of regression and coefficient of correlation for the data given below: **07**

$n = 18$, $\Sigma x = 12$, $\Sigma y = 18$, $\Sigma x^2 = 60$, $\Sigma y^2 = 96$, $\Sigma xy = 48$

- (b)** Compute Spearman's rank correlation for the following observation: (Marks are awarded out of 35) **07**

| | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|
| Candidate: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Judge x: | 20 | 22 | 28 | 23 | 30 | 30 | 23 | 24 |
| Judge y: | 28 | 24 | 24 | 25 | 26 | 27 | 32 | 30 |

OR

- Q.5 (a)** Calculate seasonal indices by the ratio to moving average method, from the following data: **07**

| | | | | |
|------|-------------------------|-------------------------|-------------------------|-------------------------|
| Year | 1 st quarter | 2 nd quarter | 3 rd quarter | 4 th quarter |
| 2012 | 68 | 62 | 61 | 63 |
| 2013 | 65 | 58 | 66 | 61 |
| 2014 | 68 | 63 | 63 | 67 |

- (b)** Calculate the first four moments about the mean from the following data: **07**

| | | | | | | | |
|-----------------|------|-------|-------|-------|-------|-------|-------|
| Marks: | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 |
| No of students: | 8 | 12 | 20 | 30 | 15 | 10 | 5 |
