Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V- EXAMINATION – SUMMER 2016

Subject Code: 151601 **Date: 19/05/2016**

Subject Name: Computer Oriented Statistical Methods

Time: 02:30 PM to 05:00 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)** Calculate the value of the polynomial $x^3 - 4x^2 + 0.1x - 0.5$ for $x = 4.011$ using floating point arithmetic with 4 digit mantissa in two different ways, namely, straightforward determination and by using nested parenthesis method. Find the relative errors in the two methods. **07**

(b) (i) Write the algorithm of Bisection method. **04**

(ii) Write the statement of Budan's theorem. How Bairstow's method is useful in root finding? **03**

Q.2 **(a)** (i) Explain the components of a time series. **04**

(ii) What are ill-conditioned equations? How will you detect that a system of linear equations is ill-conditioned or not? **03**

(b) (i) Perform three steps of False Position method to find a real root of $f(x) = x^3 - 2x - 5$ in the interval $[2,3]$. **04**

(ii) Use Newton's divided difference formula to evaluate $f(8)$ and $f(15)$ from the following table: **03**

x	4	5	7	10	11	13
y	48	100	294	900	1210	2028

OR

(b) (i) Solve $x^3 - 2x^2 - 5x + 6 = 0$ by Graffe's method. **05**

(ii) Why cubic splines are preferred to fit a graph to a set of points especially when the set of points is not that of polynomial? **02**

Q.3 **(a)** (i) If p is the pull required to lift the weight by means of a pulley block, find a linear law of the form $p = a + bw$, connecting p and w, using the following data: **05**

$w(lb)$	50	70	100	120
$p(lb)$	12	15	21	25

(ii) If $T_n(x) = cos(ncos^{-1}x)$, prove that $T_{n+1}(x) + T_{n-1}(x) = 2xT_n(x)$. **02**

(b) (i) Write an algorithm to integrate a tabulated function using Trapezoidal rule. **03**

(ii) Use Lagrange's interpolation to find the value of y when $x = 10$, if the following values of x and y are given: **04**

x	5	6	9	11
y	12	13	14	16

OR

Q.3 **(a)** Given that **07**

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 1.1$ and $x = 1.6$.

(b) (i) Find an approximate value of log_e^5 by calculating to 4 decimal places, by **04**

Simpson's one-third rule, $\int_0^5 \frac{1}{4x+5}\,dx$, dividing the range into 10 equal parts.

(ii) Evaluate $\int_{-1}^{1} \frac{1}{1+x^2}\,dx$ by three point gauss Legendre formula and compare with the exact value. **03**

Q.4 (a) (i) Solve the following system of equations using Gauss seidel method (perform only three iterations): **04**

$60x - 40y = 200, \quad -40x + 150y - 100z = 0, \quad 100y + 130z = 230$ **03**

(ii) Write an algorithm to solve a differential equation by Heun's method.

(b) Write Gauss Elimination algorithm. Also include pivotal condensation. **07**

OR

Q.4 (a) Use Runge kutta method of order 4 to compute $y(0.2)$ given that $y(0) = 1$, and $\frac{dy}{dx} = 3x + \frac{1}{2}y$. Take $h = 0.1$. **07**

(b) Solve $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$ using Taylor's series. Compute $y(0.3)$ by Milne's method with $h = 0.1$. **07**

Q.5 (a) (i) The mean marks obtained by 300 students in Statistics are 45. The mean of the top 100 of them was found to be 70 and the mean of the last 100 was known to be 20. What is the mean of the remaining students? **03**

(ii) Nine students secured the following percentage of marks in mathematics and statistics: **04**

Roll No.	1	2	3	4	5	6	7	8	9
Mathematics	78	36	98	25	75	82	90	62	65
Statistics	84	51	91	60	68	62	86	58	53

Find the Spearman's rank correlation coefficient.

(b) (i) Find the mathematical expectation of number of tails if three balanced coins are tossed. **03**

(ii) Calculate moments about assumed mean 25 and actual mean from the following data: **04**

Variable	0-10	10-20	20-30	30-40
Frequency	1	3	4	2

OR

Q.5 (a) Fit an equation of the form $Y = a + bX + cX^2$ to the following time series data: **07**

X	1	2	3	4	5
Y	25	28	33	39	46

Also calculate trend values of Y for $X = 1, 2, 3, 4, 5$.

(b) Calculate seasonal indices by the "ratio to moving average method" from the following data: **07**

Year	I Quarter	II Quarter	III Quarter	IV Quarter
1991	68	62	61	63
1992	65	58	66	61
1993	68	63	63	67

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