

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-V • EXAMINATION – SUMMER 2013

Subject Code: 151601**Date: 14-05-2013****Subject Name: Computer Oriented Statistical Methods****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) Determine the value of $y(0.4)$ using Milne's predictor-corrector method **07**
 given $y' = xy + y^2$, $y(0) = 1$. Use Taylor series method to get the values of
 $y(0.1)$, $y(0.2)$ and $y(0.3)$.

(b) Evaluate $\int_0^1 x^x dx$ using (i) Trapezoidal rule with $h = 0.1$ **07**
 (ii) Simpson's 1/3 and 3/8 rules with $h = 1/6$.

Q.2 (a) Solve $x^3 - 2x^2 - 5x + 6 = 0$ by Graeffe's method by squaring the roots thrice. **07**

(b) State Budan's theorem and apply it to find the number of roots of the **07**
 equation $f(x) = x^4 - 4x^3 + 3x^2 - 10x + 8$ in the intervals $[-1, 0]$ and $[0, 1]$.

OR

(b) Using Lin-Bairstow method, Solve $x^4 - 8x^3 + 39x^2 - 62x + 50 = 0$ upto **07**
 third iteration starting with $p_0 = 0$ and $q_0 = 0$

Q.3 (a) Solve the equations $x^2 + y - 11 = 0$ and $x + y^2 - 7 = 0$ starting with initial **05**
 values $x_0 = 3.5$, $y_0 = -1.5$ by using Newton-Raphson method.

(b) Using secant method, find a root of the equation $x^3 - 9x + 1 = 0$ correct to **05**
 four decimal places.

(c) Find a root of the equation $x^4 - x - 10 = 0$ correct to three decimal places, **04**
 using the bisection method.

OR

Q.3 (a) Define rate of convergence of an iterative method. **05**
 Prove that Newton-Raphson method has second order convergence.

(b) Use false position method to find approximate root of $x^3 - 5x - 7 = 0$ correct **05**
 to four decimal places.

(c) Find an iterative formula to find square root of a positive number N by **04**
 Newton-Raphson method, using it find $\sqrt{20}$ correct to four decimal places.

Q.4 (a) Apply Runge-Kutta method to find an approximate value of y for $x = 0.2$ in **05**
 steps of 0.1 if $\frac{dy}{dx} = x + y^2$, given that $y = 1$ when $x = 0$.

(b) Solve the following system of equations by Gauss-Jacobi method correct to **05**
 three decimal places
 $8x - 3y + 2z = 20$, $4x + 11y - z = 33$, $6x + 3y + 12z = 35$

(c) Answer the following (Each question is of one mark) **04**

- (i) Give names of any two direct methods to solve the system of simultaneous linear equations.
- (ii) Define Ill conditioned system and Well conditioned system.
- (iii) Define Truncation error with example.
- (iv) What are the normal equations to fit a parabola $y = a + bx + cx^2$ by the method of least squares.

OR

- Q.4 (a)** Fit a second degree curve of the form $y = ax + bx^2$ to the following data **05**
by the method of least squares
 $x : 1 \quad 2 \quad 3 \quad 4 \quad 5$
 $y : 1.8 \quad 5.1 \quad 8.9 \quad 14.1 \quad 19.8$
- (b)** Obtain the least squares straight line fit to the following data **05**
 $x : 0.2 \quad 0.4 \quad 0.6 \quad 0.8 \quad 1$
 $f(x) : 0.447 \quad 0.632 \quad 0.775 \quad 0.894 \quad 1$
- (c)** Evaluate $\int_0^1 \frac{1}{1+x} dx$ using Gauss-Legendre three-point formula. **04**
- Q.5 (a)** Obtain the Chebyshev linear approximation of the function $f(x) = x^3$ on **05**
 $[0, 1]$.
- (b)** Obtain the cubic spline approximation for a function given by the data **05**
 $x : 0 \quad 1 \quad 2 \quad 3$
 $y : 1 \quad 2 \quad 33 \quad 244$ with $M(0) = 0$, $M(3) = 0$.
- (c)** If $R = x^3 y^2 z^2$ and 0.03, 0.01, 0.02 are errors in x, y, z respectively at **04**
 $x = 1, y = 1, z = 2$. Calculate the absolute error and percentage error in calculating R.

OR

- Q.5 (a)** The first four moments of distribution about $x = 2$ are 1, 2.5, 5.5 and 16. **05**
Calculate the four moments about $\bar{x}$ and about zero.
- (b)** Find correlation coefficient for the data given below. **05**
 $x : 4 \quad 5 \quad 9 \quad 14 \quad 18 \quad 22 \quad 24$
 $y : 16 \quad 22 \quad 11 \quad 16 \quad 7 \quad 3 \quad 17$
- (c)** The number of bacterial cells (X) per unit volume in a culture at different **04**
hours (Y) is given below
 $X : 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9$
 $Y : 43 \quad 46 \quad 82 \quad 98 \quad 123 \quad 167 \quad 199 \quad 213 \quad 245 \quad 272$
 Fit a line of regression of Y on X and estimate the number of bacterial cells after 15 hours.
