

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – WINTER 2013****Subject Code: 151601****Date: 27-11-2013****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) (i) Define normal form of a floating point number. Also, prove that for three floating point numbers a , b and c , $a \times \frac{b}{c}$ may not be equal to $\frac{a}{c} \times b$. 04
- (ii) For $a = 3.141592$ and an approximate value of a is 3.14 , evaluate absolute error, relative error and percentage error. 03
- (b) (i) Evaluate $\int_{-1}^1 \frac{1}{1+x^2} dx$ by one point and two points Gaussian quadrature formula. Compare your answer with the exact value of the integral. 04
- (ii) Explain ill-conditioned system of the linear equations. 03
- Q.2** (a) Perform three iterations of the Newton-Raphson method to solve the system of equations $x^2 + xy + y^2 = 7$, $x^3 + y^3 = 9$.
Take the initial approximations as $x_0 = 1.5$, $y_0 = 0.5$. 07
- (b) (i) Define rate of convergence and prove that the Newton-Raphson method has second order convergence. 04
- (ii) Perform two operations of the bisection method to find an approximate root of $f(x) = 3x^3 + 10x^2 + 10x + 7 = 0$. 03
- OR**
- (b) (i) State Budan's theorem and apply it to find the number of roots of the equation $f(x) = x^4 - 4x^3 + 3x^2 - 10x + 8 = 0$ in the interval $[-1, 0]$. 04
- (ii) State Descarte's rule of signs and apply it to 03
- $P_5(x) = 8x^5 + 12x^4 - 10x^3 + 17x + 5 = 0$.
- Q.3** (a) Obtain the cubic spline approximation for the function given by the data 07
- | | | | | |
|--------|---|---|----|-----|
| x | 0 | 1 | 2 | 3 |
| $f(x)$ | 1 | 2 | 33 | 244 |
- With $M(0) = 0, M(3) = 0$. Hence find an estimate of $f(2.5)$.
- (b) Find the linear polynomial approximation to the function $x^3 + 2$ on $[1, 2]$ 07
- OR**
- Q.3** (a) Consider the following table: 07
- | | | | |
|--------|-------|-------|-------|
| x | 20 | 25 | 30 |
| $f(x)$ | 0.342 | 0.423 | 0.500 |
- Find the value of x where $f(x) = 0.399$ using inverse interpolation.
- (b) Using Newton's formulae, find $f(x)$, at $x=1841$ and $x=1941$. 07
- | | | | | | |
|--------|------|------|------|------|------|
| x | 1891 | 1901 | 1911 | 1921 | 1931 |
| $f(x)$ | 46 | 66 | 81 | 93 | 101 |
- Q.4** (a) State Trapezoidal rule. Evaluate $\int_{0.2}^{1.4} (\sin x - \log x + e^x) dx$ with $h = 0.1$ by Simpson's $\frac{1}{3}$ and $\frac{3}{8}$ rules. 07
- (b) (i) Solve the following system by Gauss elimination method: 04
- $$2x - y + 3z = 8, -x + 2y + z = 4, 3x + y - 4z = 0$$

- (ii) Using Taylor series method, find $y(1.1)$ correct to four decimal places, given that $\frac{dy}{dx} = xy^{\frac{1}{3}}, y(1) = 1$ 03

OR

- Q.4 (a) Solve the following system by Gauss-Jacobi method: 07

$$27x + 6y - Z = 85, \quad 6x + 15y + 2z = 72, \quad x + y + 54z = 110$$

- (b) Apply fourth order Runge-Kutta method to find an approximate value of y for $x = 0.2$ with $h = 0.1$ if $\frac{dy}{dx} = x + y^2$, given that $y = 1$ when $x = 0$. 07

- Q.5 (a) (i) Obtain the median for the following distribution: 04

x	1	2	3	4	5	6	7	8	9
f	8	10	11	16	20	25	15	9	6

- (ii) Three unbiased coins are tossed, then find the expectation of number of tails. 03

- (b) Find the equation of the lines of regression based on the following data: 07

x	4	2	3	4	2
y	2	3	2	4	4

OR

- Q.5 (a) Obtain the median for the following distribution: 07

Mid value:	15	20	25	30	35	40	45	50	55
Frequency:	2	22	19	14	3	4	6	1	1
Cummulative f :	2	24	43	57	60	64	70	71	72

- (b) The probability distribution of a random variable x is given below 07

x	-2	-1	0	1	2
$p(x)$	$\frac{1}{12}$	$\frac{1}{3}$	p	$\frac{1}{4}$	$\frac{1}{6}$

Find (i) $E(x)$, (ii) $E(2x + 3)$, (iii) $E(x^2 + 2)$
