07821

MCA (Revised)

Term-End Examination

December, 2011

MCSE-004 : NUMERICAL AND STATISTICAL COMPUTING

Time : 3 hours   *Maximum Marks : 100*

*Note :   Question No. 1 is **compulsory**. Attempt **any three** from the rest. Use of calculator is **allowed**.*

1. (a)   Define Error.   2+6

Solve the quadratic equation $x^2 + 9.9x - 1 = 0$ using two decimal digit arithmetic with rounding.

(b)   Use Bisection Method to find a root of the   8
equation $x^3 - 4x - 9 = 0$. Go upto 5 iteration only.

(c)   Solve the equations :   8

$2x + 3y + z = 9$

$x + 2y + 3z = 6$

$3x + y + 2z = 8$

by LU decomposition Method.

(d)   From the following table. Find the value of **8**
      $e^{1.17}$, using backward interpolation formula.

X	1.00	1.05	1.10	1.15	1.20
e^X	2.7183	2.8577	3.0042	3.1582	3.3201

(e)   Evaluate the integral $\int_0^6 \left(x^2+x+2\right) dx$ using **8**
      Trapezoidal rule with h = 1.0

2.   (a)   Find a real root of the equation **10**
           $$x^3 + x^2 - 1 = 0$$
           on the interval [0,1] using successive
           iteration method, upto three iterations only.

     (b)   Use Gauss Elimination to solve the system **10**
           of equations.
           $$10x_1 - 7x_2 = 7$$
           $$-3x_1 + 2.099x_2 + 6x_3 = 3.901$$
           $$5x_1 - x_2 + 5x_3 = 6$$
           upto 3 iterations only.

3.   (a)   Use Runge - Kutta method to solve the initial **10**
           value problem.
           $y' = (t-y)/2$ on [0,0.2] with $y(0) = 1$.
           Compare the solutions with h = 0.2 and 0.1.

     (b)   Evaluate the integral $I = \int_0^{P/2} \sin x \ dx$ **10**

           Using the Gauss-Legendre formulas.
           Compare with the exact solution (the exact
           value is I = 1).

4. (a) Find the Lagrange interpolating polynomial   **10**
of degree 2 approximating the function
$y = ln\ x$ defined by the following table of
values. Hence determine the value of $ln\ 2.7$.

X	2	2.5	3.0
$y = ln\ x$	0.69315	0.91629	1.09861

Also estimate the error in the value of y.

(b) $\int_{1}^{6} [2 + \sin(2\sqrt{x})]\ dx$ **10**

Evaluate the above integral using
trapezoidal rule with 5 points.

5. (a) A manufacturer of cotter pins knows that   **8**
5% of his product is defective. If he sells
cotter pins in boxes of 100 and guarantees
that not more than 10 pins will be defective.
What is the approximate probability that a
box will fail to meet the guaranteed
quality ?

(b) Find the most likely price in Bombay   **8**
corresponding to the price of Rs. 70 at
Calcutta from the following :

	Calcutta	Bombay
Average price	65	67
Standard Deviation	2.5	3.5

Correlation coefficient between the prices
of commodities in the two cities is 0.8.

(c) Show that the moment generating function   **4**
of a random variable χ which is chi - square
distributed with v degrees of freedom is
$M(t) = (1 - 2t)^{-V/2}$.