

07354

MCA (Revised)
Term-End Examination
December, 2010

**MCSE-004 : NUMERICAL AND STATISTICAL
 COMPUTING**

*Time : 3 hours**Maximum Marks : 100*

Note : Question number 1 is compulsory. Attempt any three questions from the rest. Use of calculator is allowed.

1. (a) The solution of a problem is given as 3.436. 5
 It is known that absolute error in the solution is less than 0.01. Find the interval within which the exact value must lie.
- (b) Find the truncation error in the result of the 5
 following function for $x = \frac{1}{5}$ when we use first three terms.
- $$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \frac{x^5}{5!} + \frac{x^6}{6!}$$
- (c) Find a real root of the equation $x \log_{10} x = 1.2$ 6
 by regula-falsi method correct to four decimal places.

- (d) In the table below, the values of y are consecutive terms of a series of which 23.6 in the 6th term. Find the first and tenth terms of the series. 6

$x :$	3	4	5	6	7	8	9
$y :$	4.8	8.4	14.5	23.6	36.2	52.8	73.9

Using Newton's forward interpolation formula.

- (e) From the given table, evaluate the number of persons having incomes between Rs. 1000 and Rs. 1500 by applying Lagrange's formula. 6

Income	Below 400	500 - 1000	1000 - 2000	2000 - 3000	3000 - 4000
No. of Persons	6000	4250	3600	1500	650

- (f) A husband and wife appear in an interview for two vacancies in the same post. The probability of husband's selection is $\frac{1}{7}$ and that of wife's selection is $\frac{1}{5}$. What is the probability that : 6
- (i) Both of them will be selected,
 - (ii) Only one of them will be selected and
 - (iii) None of them will be selected.

- (g) From the following data of rainfall and production of rice, find the most likely production corresponding to the rainfall 40 cms. 6

	Rainfall (cms)	Production of Rice (Quintals)
Mean	35	50
Standard Deviation	5	8

Coefficient of Correlation is +0.8.

2. (a) Find a root of $x - \cos x = 0$ using Bisection method. 6

- (b) Find the approximate value of $I = \int_0^1 \frac{dx}{1+x}$ 7
using trapezoidal rule. Obtain a bound for the errors. The exact value of $I = \ln 2 = 0.693147$ correct to six decimal places.

- (c) Out of 800 families with 4 children each, 7
what percentage would be expected to have :
(i) at least one boy (ii) No girls (iii) 2 boys and 2 girls (iv) at most 2 girls.

3. (a) Solve by Jacobi's iteration method, the 10
equations are :

$$20x + y - 2z = 17$$

$$3x + 20y - z = -18$$

$$2x - 3y + 20z = 25$$

- (b) The table gives the distance in nautical miles of the visible horizon for the given heights, in feet, above the earth's surface : 10

$x = \text{height}$	100	150	200	250	300	350	400
$y = \text{distance}$	10.63	13.03	15.04	16.81	18.42	19.90	21.27

Find the value of y when $x = 410$ feet using Newton's Backward interpolation formula.

OR

Suppose that a manufactured product has 2 defects per unit of product inspected. Using poisson distribution calculate the probabilities of finding a product without any defect, 3 defects and 4 defects. 10

4. (a) Solve the following system of equations : 6

$$10x_1 - x_2 + 2x_3 = 4$$

$$x_1 + 10x_2 - x_3 = 3$$

$$2x_1 + 3x_2 + 20x_3 = 7$$

Using the Gauss elimination method.

- (b) Apply Euler's method to find the solution of $y' = y - \frac{2x}{y}$ 7

$$\text{solution of } y' = y - \frac{2x}{y}$$

on the interval $[0, 1]$, with initial condition $y(0) = 1$ for $h = 0.2$.

- (c) A can solve 90% of the problems given in a book and B can solve 70%. What is the probability that at least one of them will solve a problem selected at random ? 7

5. (a) When a computer uses a number base 2, how many significant decimal digits are contained in the mantissa of floating numbers ? 7
- (b) Solve the initial value problem given as : 7
$$u^1 = -2tu^2, u(0) = 1$$
with $h = 0.2$ on the interval $[0, 0.4]$ use the fourth order classical Runge-Kutta method.
- (c) State properties of Linear Correlation and Regression, with appropriate justifications. 6
-