09519

MCA (Revised)

Term-End Examination

June, 2014

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 calculators is* ***allowed.***

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1. (a) Determine the root of the equation $2x = \cos x + 3$ correct to three decimal places. **5**

(b) Solve the following system of equations by using Gauss Elimination method. **5**

$$2x + y + z = 10$$
$$3x + 2y + 3z = 18$$
$$x + 4y + 9z = 16$$

(c) Using Lagrange interpolation, determine the value of $\log_{10} 301$, from the tabulated data given below : **5**

X	300	304	305	307
$\log_{10} X$	2.4771	2.4829	2.4843	2.4871

(d) Ten coins are thrown simultaneously, Find the probability of getting at least seven heads. 5

(e) What do you mean by "Goodness to fit test" ? What for the said test is required ? 5

(f) Calculate the value of the integral $\int_4^{5.2} \log x \, dx$ by using Simpsons 3/8 rule 5

(g) Find the probability that an individual's IQ score is between 91 and 121. Provided, the individuals IQ score has a Normal distribution N (100, 15^2). 5

(h) Write short note on following : 5

(i) Non Linear Regression

(ii) Acceptance Rejection Method

2. (a) Determine the value of expression 5

$X = \sqrt{3} + \sqrt{5} + \sqrt{7}$;

accurate up to 4 significant digits, also find the absolute and relative errors.

(b) Determine the value of Y using Euler's method, when $X = 0.1$ Given $Y(0) = 1$ and $Y' = X^2 + Y$. 5

(c) Find the value of $\Delta \tan^{-1} x$, where Δ is the difference operator, with differencing step size 'h'. 3

(d) Solve the following system of equations by using LU Decomposition method. 7

$x + y = 2$; $2x + 3y = 5$

3. (a) Solve the initial value problem given below, By using Runge - Kutta Method. **10**

$$\frac{dy}{dx} = y - x \quad \text{with} \quad y(0) = 2 \quad \text{and} \quad h = 0.1$$

also find $y(0.1)$ and $y(0.2)$ correct to four decimal places.

(b) Determine the Goodness to fit parameter 'R' for the data given below. **10**

X	100	110	120	130	140	150	160	170	180	190
Y	45	51	54	61	66	70	74	78	85	89

Analyse the results and comment on whether the predicted line fits well into the data or not.

4. (a) Develop the difference table for the data given below and use it to find the first and tenth term for the given data. **10**

X	3	4	5	6	7	8	9
Y	2.7	6.4	12.5	21.6	34.3	51.2	72.9

(b) Find the smallest root of the equation $f(x) = x^3 - 6x^2 + 11x - 6 = 0$ by using Newton - Raphson method. Give two drawbacks of Newton - Raphson method. **10**

5. (a) In a partially destroyed laboratory record of an analysis of correlation data, the following data are only legible : **10**

(i) Variance of $X = 9$

(ii) Regression equation :

$8X - 10Y + 66 = 0$

$40X - 18Y = 214$

Using this legible data determine the following :

(i) Mean value of X and Y

(ii) Correlation coefficient between X and Y

(iii) Standard Deviation of Y

(b) Evaluate the integral $I = \int_0^1 \frac{dx}{1+x}$ by using composite Trapezoidal rule with 2 and 4 sub intervals. 5

(c) Find the approximate value of the root of the equation $x^3 + x - 1 = 0$, near $x = 1$. Using Regula-Falsi method, twice. 5