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MCSE-004

MCA (Revised)

Term-End Examination, 2019 00372

MCSE-004 : NUMERICAL AND STATISTICAL COMPUTING

Time : 3 Hours] **[Maximum Marks : 100**

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

1. (a) Find the roots of the equation $\cos x - 2x + 3 = 0$, correct to three decimal places. [5]

(b) Solve the following system of equations by using Gauss-Elimination method : [5]

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

$$3x_1 + 2x_2 + 3x_3 = 18$$

$$x_1 + 4x_2 + 9x_3 = 16$$

(c) Determine the value of $\log_{10}301$, by using lagrange interpolation on the tabulated data given below : [5]

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

(d) What is the probability of getting at least seven heads, when ten coins are thrown simultaneously ? [5]

(e) What is "Goodness to fit test" ? Briefly discuss the utility of "Goodness to fit test". [5]

(f) Evaluate $\int_{4}^{5.2} log\, y\, dy$ by using Simpsons 3/8 rule. [5]

(g) Given, the IQ score of individuals, has Normal distribution N(100, 15^2). Determine the probability that an individual's IQ score is between 91 and 121. [5]

(h) Briefly discuss the following : [5]

(i) Non Linear Regression

(ii) Acceptance Rejection method

2. (a) Use Newton-Raphson method to find a root of the equation $x^3-2x-5=0$ [5]

(b) The tangent of the angle between the lines of regression y on x and x on y is 0.6, and $\sigma_x = \frac{1}{2}\sigma_y$. Find r_{xy}. [10]

(c) Evaluate $\int_0^1 \frac{dx}{1+x}$ using Composite Trapezoidal rule with n=2 and 4. [5]

(d) A polynomial passes through the following set of points : [5]

x	1	2	3	4
y	-1	-1	1	5

Find the polynomial using Newton's Forward Interpolation.

3. (a) Solve the following system of linear equation by Jacobi's Method : [7]

$2x - y + z = -1$

$x + 2y - z = 6$

$x - y + 2z = -3$

(b) What are the pitfalls of Gauss-Elimination method ? [3]

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

4. (a) Solve the following system of equations by using LU decomposition method : [5]

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

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

(c) Determine the Goodness to fit parmeter '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 lines fits well into the data or not.

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 :

$$8x - 10y + 66 = 0$$

$$40x - 18y - 214 = 0$$

Using the legible data given above, determine the following :

(i) Mean value of x and y

(ii) Correlation Coefficient between x and y

(iii) Standard deviation of y

(b) What do you mean by the term "Accuracy" and "Precision" ? How are they related to the significant digits ? [5]

(c) What are residual plots ? Discuss the utility and disadvantage of residual plots. [5]

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