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MCSE-004

MCA (Revised)

Term-End Examination, 2019

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) If 0.333 is the approximate value of (1/3), find absolute, relative and percentage error. [3]

(b) Determine the number of iterations required, to obtain the smallest positive root of $x^3 - 2x - 5 = 0$. correct upto two decimal places, when Bisection method is used. [5]

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

$$\begin{aligned} x + 2y + z &= 3 \\ 2x + 3y + 3z &= 10 \\ 3x - y + 2z &= 13 \end{aligned}$$

(d) Write probability distribution formula for Binomial distribution and Poisson distribution. [2]

(e) Determine the value of f(x) at x=4, using Lagrange Interpolation formula on the data given below : [5]

x	1.5	3	6
f(x)	2.5	2	20

(f) Calculate the value of $\int_{0}^{0.6} e^{x} dx$, correct to five significant figures; by using Simpson's (1/3) rule. (Take n=6). [5]

(g) If a bank receives on an average $\lambda = 6$ bad cheques per day. What is the probability that it will receive 4 bad cheques on any given day? [5]

(h) Following data is given for marks in subject A and B of certain examination : [7]

	Subject A	Subject B
Mean Marks	36	85
Standard Deviation	11	8

Given, the coefficient of correlation between A and B = ± 0.66.

(i) Determine the two equations of regression.

(ii) Calculate the expected marks in A, corresponding to 75 marks obtained in B.

(i) For $x = 0.5555\,E1$; $y = 0.4545\,E1$ and $z = 0.4535\,E1$, prove that $x(y-z) \neq xy - xz$. [3]

2. (a) Solve the Quadratic equation $4x^2 + 8x - 21 = 0$ using two decimal digit arithmetic with rounding, using any two of the following methods : [10]

(i) Bisection method

(ii) Secant method

(iii) Regula Falsi method

(b) Solve the initial value problem $u' = -2tu^2$, with $u(0) = 1$, $h = 0.2$ on the interval [0,1]. Use the fourth order classical Runge-Kutta method. [10]

3. (a) Obtain the positive root of the equation $x^2 - 1 = 0$ by Newton-Raphson method, correct to two decimal places. [8]

(b) Solve the following system using LU decomposition method : [7]

$$\begin{aligned} 6x_1 - 2x_2 \quad\quad &= 14 \\ 9x_1 - x_2 + x_3 &= 21 \\ 3x_1 + 7x_2 + 5x_3 &= 9 \end{aligned}$$

(c) Determine the lowest degree polynomial, which satisfies the following set of values, using forward difference. Also find the polynomial : [5]

x	0	1	2	3	4	5	6	7
f(x)	0	7	26	63	124	215	342	511

4. (a) Calculate the value of the Integral $\int_4^{5.2} \log x \, dx$ by using Simpson's (1/3) rule and Simpson's (3/8) rule. [10]

(b) Compute the value of R and R^2 for the data given below, where $R = S_{xy} / \sqrt{S_{xx} S_{yy}}$. [5]

Sample Size (i)	12	21	15	1	24
x_i	0.96	1.28	1.65	1.84	2.35
y_i	138	160	178	190	210
$\hat{y}_i$	138				
$\hat{e}_2$	0				

Regression equation $\hat{y}_i = 90 + 50x_i$ is used to fill the table where $\hat{e} = y_i - \hat{y}_i$.

(c) Solve the following system of equations by using Jacobi Method, determine the results for two approximations : [5]

$$\begin{aligned} 3x + 4y + 15z &= 54.8 \\ x + 12y + 3z &= 39.66 \\ 10x + y - 2z &= 7.74 \end{aligned}$$

5. (a) Write Short notes on the following : [6]

(i) Binomial Distribution

(ii) Poisson Distribution

(iii) Normal Distribution

(b) Three bags of same type have the following balls : [6]

Bag 1 : 2 Black and 1 White

Bag 2 : 1 Black and 2 White

Bag 3 : 2 Black and 2 White

One of the bag is selected and one ball is drawn. It turns out to be white. What is the probability of drawing a white ball again :

(i) When the first one is returned/replaced.

(ii) When the first one is not returned/replaced.

(c) Calculate the correlation coefficient for the following data : [8]

x :	65	66	67	67	68	69	70	72
y :	67	68	65	68	72	72	69	71

Obtain the equations of lines of regression. Also estimate the value of x for y = 70.

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