

MCA (DUAL DEGREE)
(SEM. IV) THEORY EXAMINATION 2017-18
COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES

*Time: 3 Hours**Total Marks: 100***Note:** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief. 2 x 10 = 20**

- a. Explain the floating point representation of numbers
- b. Find the absolute and relative error if $\frac{2}{3}$ is approximated by 0.6667.
- c. Write an iterative formula using Newton-Raphson method to find the square root of a positive number.
- d. Prove that $\mu\delta = \frac{1}{2}\Delta E^{-1} + \frac{1}{2}\Delta$
- e. Write the Lagrange Interpolation formula.
- f. Write Trapezoidal's formula for numerical integration.
- g. The two regression lines are $8x - 10y + 66 = 0$ and $40x - 18y = 214$. Find the mean values of x and y.
- h. Explain the term Pi-Chart.
- i. What is the difference between interpolation and extrapolation ?
- j. Differentiate between ill conditioned and well conditioned methods.

SECTION B**2. Attempt any three of the following: 10 x 3 = 30**

- a. Find the root of the $\tan x + \tanh x = 0$ which lies in the interval (1.6, 3.0) correct to four significant digits using method of false position.
- b. Apply a central difference formula to obtain $f(32)$ given that $f(25) = 0.2707$, $f(30) = 0.3027$, $f(35) = 0.3386$, $f(40) = 0.3794$
- c. Apply Bessel's formula to obtain value of y for $x = 25$, from the following table

x	20	24	28	32
y	2854	3162	3544	3992
- d. Solve the following equations by using Gauss-Seidal iteration method

$$27x + 6y - z = 85$$

$$6x + 15y + 2z = 72$$

$$x + y + 54z = 110$$
- e. Using Taylor's series, find the solution of the diff. equation $xy' = x - y$, $y(2) = 2$ at $x = 2.1$ correct to five decimal places.

SECTION C**3. Attempt any one part of the following: 10 x 1 = 10**

- (a) Find a real root of the equation $x = e^{-x}$ using the Newton-Raphson method.
- (b) Explain, what do you understand by rate of convergence and find the rate of convergence of Bisection method.

4. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Derive the Newton's Forward Difference Formula.
(b) Compute the value of $f(x)$ for $x = 2.5$ from the following table :

x	1	2	3	4
f(x)	1	8	27	64

Using Lagrange's interpolation method.

5. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Find $\int_0^6 \frac{e^x}{1+x} dx$ approximately using Simpson's $3/8^{\text{th}}$ rule on integration.
(b) Find $y(2)$ if $y(x)$ is the solution of $\frac{dy}{dx} = \frac{1}{2}(x + y)$ using Runge-Kutta method, in two steps taking $h = 1.0$, Given $y(0) = 2.0$.

6. Attempt any *one* part of the following: 10 x 1 = 10

- (a) What is curve fitting? Explain the method of least squares to fit a curve.
(b) Determine the constants a and b by the method of least squares such that $y = ae^{bx}$ fits the following data :

x	1	5	7	9	12
y	10	15	12	15	21

7. Attempt any *one* part of the following: 10 x 1 = 10

- (a) The following table gives age (x) in years of cars and annual maintenance cost (y) in hundred rupees :

x	1	3	5	7	9
y	15	18	21	23	22

Estimate the maintenance cost for a 4 year old car after finding the regression equation.

- (b) Write short notes on
i) Test of significance
ii) Regression Analysis
iii) Chi-Square test