MCA
(SEM. II) THEORY EXAMINATION
COMPUTER BASED NUMERICAL & STATISTICAL TECHNIQUES

Time: 3 Hours   *Total Marks:* **70**

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt *all* questions in brief.**   **2 x 7 = 14**

   a.   Find the absolute and relative error if the number $x = .004997$ is rounded off to three decimal digits.
   b.   Describe Backward Differences with example.
   c.   Prove that $(1 + \Delta).(1 - \nabla) = 1$
   d.   Write an iterative formula using Newton-Raphson method to find the square root of a positive number.
   e.   Discuss fourth order Runge-Kutta method.
   f.   Write short notes on Trapezoidal rule.
   g.   Explain Chi-Square test.

SECTION B

2.   **Attempt any *three* of the following:**   **7x 3 = 21**

   a.   Find the root of $xe^x = 2$ correct to four significant digits using Regula-falsi method.
   b.   What do you mean by divided difference? Derive Newton's divided formula.
   c.   Apply Gauss's forward formula to find the value of u_9, if $u_0 = 14$, $u_4 = 24$, $u_8 = 32$, $u_{12} = 35$, $u_{16} = 40$
   d.   Solve the following equations by using Gauss-Seidal iteration method
$$27x + 6y - z = 85$$
$$6x + 15y + 2z = 72$$
$$x + y + 54z = 110$$
   e.   Explain all the steps involved in forecasting.

SECTION C

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

   (a)   Find a root of the equation $8x^3 - 2x - 1 = 0$ using Bisection method is four stages.
   (b)   Derive an expression for rate of convergence of Secant method.

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

   (a)   Derive the Newton's Backward Interpolation Formula.
   (b)   Find $\frac{dy}{dx}$ at $x = 6$ given that

x	4.5	5.0	5.5	6.0	6.5	7.0	7.5
y	9.69	12.90	16.71	21.18	26.37	32.34	39.15

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

   (a)   Solve $\frac{dy}{dx} = 1 + xy$ with $x_0 = 2$, $y_0 = 0$ using Picard's method of successive approximations.

   (b)   Use Simpson's 1/3rd rule to find $\int_0^{0.6} e^{-x^2} dx$ by taking seven ordinates.

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

   (a)   Obtain a relation of the form $y = ae^{bx}$ for the following data by the method of least squares:

x	1	2	3	4	5	6
y	1.6	4.5	13.8	40.2	125	300

   (b)   From the given data, obtain the two regression lines using method of least squares:

x	6	2	10	4	8
y	9	11	5	8	7

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

   (a)   Define Times Series and explain the utility of time series analysis.

   (b)   Describe Moving average method. From the following data, calculate 4 years moving average

Year	1	2	3	4	5	6	7	8	9	10
Output	20	21	23	22	25	24	27	26	28	30