18/12/17

Roll No. ....

Total Pages: 4

## MCA/D-17

10313

# COMPUTER ORIENTED NUMERICAL AND STATISTICAL METHODS

Paper: MCA-14-15

Time: Three Hours] [Maximum Marks: 80]

Note: Attempt five questions in all. Question No. 1 is compulsory. In addition, attempt one question from each unit.

## **Compulsory Question**

- 1. (a) Explain and find the order of convergence of Regula-Falsi and Bisection method.
  - (b) Discuss various pitfalls in numerical differentiation.
  - (c) Prove that regression coefficients are independent of the change of origin but not of change of scale.
  - (d) What is Sampling? Explain various types of sampling.

#### UNIT-I

Find real root of the equation  $x^3 - 4x + 1 = 0$ , correct up to 3 decimal places using Bisection, Newton-Raphson and Regula-Falsi methods. Also compare the number of iterations required to obtain the desired accuracy.

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3. (a) Solve the following equations by Gauss Elimination method:

$$x_1 + 2x_2 + 3x_3 = 14$$

$$2x_1 + 5x_2 + 2x_3 = 18$$

$$3x_1 + x_2 + 5x_3 = 20.$$

(b) Given

x	4.5	4	5	7	10	11	15
f(x)	:	48	100	294	900	1210	2028

Find f(15) using Newton's Divided difference method.

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## In addition, attempt II-TINUstion from each unit.

- 4. (a) Solve  $\frac{dy}{dx} = \log(x+y)$  with y(0) = 2 by Predictor-corrector method at x = 1.2 with h = 0.2.
  - (b) Given  $\frac{dy}{dx} = y x$ , y(0) = 2.

Find the value of y when x = 0.1 and h = 0.1 by Runga-Kutta Fourth order method.

- 5. (a) Evaluate  $\int_{-3}^{3} x^4 dx$  by using Trapezoidal's rule, Simpson's 1/3 rule and Simpson's 3/8 rule. Compare the results with its actual value.
  - (b) Derive the formula to fit a curve  $y = ae^{bx}$ . Fit the curve  $y = ae^{bx}$  for the following data:

x	0	1	2	3
у	5	8	15	32

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### UNIT-III

- 6. Prove the following properties of Chebyshev's polynomials:
  - (a) Show that  $T_n(x)$  satisfy the following differential equation:

$$(1-x^2)\frac{d^2y}{dx^2} - x \frac{dy}{dx} + n^2y = 0$$
 where  $y = T_n(x)$ .

- (b) Prove that the polynomials  $T_n(x)$  are orthogonal with the function  $1/\operatorname{sqrt}(1-x^2)$ .
- 7. (a) If the mean of Poisson distribution is 2, find the probability for 1, 2 & 3 successes respectively. Given  $e^{-2} = 0.1353$ .
  - (b) Find the mode of the following frequency distribution using the method of grouping:

Marks	5	10	15	20	25	30	35	40	45	50
No. of Students	20	43	75	67	72	45	39	9	8	6

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#### **UNIT-IV**

- 8. Define Time series. Mention its importance and components with illustrations, and describe a method of smoothing of time series.
- 9. To access the significance of possible variation in performance in a certain test between the CBSE schools of a city, a common test was given to a number of students taken at random from the senior fifth class to each of the four schools concerned. The results are given below:

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24	18	32	24
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14	8	16	30

Make Analysis of Variance of data.

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