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. 4

(b) Discuss various pitfalls in numerical differentiation. 4

(c) Prove that regression coefficients are independent of the change of origin but not of change of scale. 4

(d) What is Sampling ? Explain various types of sampling. 4

UNIT–I

2. 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. 16

3. (a) Solve the following equations by Gauss Elimination method : 8

$$x_1 + 2x_2 + 3x_3 = 14$$
$$2x_1 + 5x_2 + 2x_3 = 18$$
$$3x_1 + x_2 + 5x_3 = 20.$$

(b) Given

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

Find $f(15)$ using Newton's Divided difference method. 8

UNIT–II

4. (a) Solve $\frac{dy}{dx} = \log(x+y)$ with $y(0) = 2$ by Predictor-corrector method at $x = 1.2$ with $h = 0.2$. 8

(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. 8

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. 8

(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
y	5	8	15	32

8

UNIT–III

6. Prove the following properties of Chebyshev's polynomials :

   (a) Show that $T_n(x)$ satisfy the following differential equation :

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

   (b) Prove that the polynomials $T_n(x)$ are orthogonal with the function 1/sqrt(1 – x^2). 16

7. (a) If the mean of Poisson distribution is 2, find the probability for 1, 2 & 3 successes respectively. Given e^{-2} = 0.1353. 6

   (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

10

UNIT–IV

8. Define Time series. Mention its importance and components with illustrations, and describe a method of smoothing of time series. 16

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 :

SCHOOLS			
A	B	C	D
16	24	36	26
20	22	24	18
24	18	32	24
16	28	12	32
14	8	16	30

Make Analysis of Variance of data. 16