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Printed Pages : 4

21/12/16

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MCA / D–16

COMPUTER ORIENTED NUMERICAL AND STATISTICAL METHODS

Paper–MCA–14-15

Time allowed : 3 hours] *[Maximum marks : 80*

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

Compulsory Question

1. (a) What is interpolation and extrapolation ? Discuss. 4

   (b) Derive the general formula for numerical integration. 4

   (c) What are the characteristics of normal distribution ? 4

   (d) State the importance of chi-square test. 4

Unit–I

2. (a) Find the real root of the equation $x e^x - 3 = 0$ by Regula Falsi method correct up to three decimal points. 8

   (b) Find root of the equation $4 (x - \sin x) = 1$ by Newton-Raphson method correct to three decimal digits. 8

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

$$20x + y - 2z = 17$$

$$3x + 20y - z = 18$$

$$2x - 3y + 20z = 25$$

8

(b) Use Newton's backward interpolation formula to the data given below to obtain a polynomial of degree 4 in x. 8

X	1	2	3	4	5
Y	1	−1	1	−1	1

Unit–II

4. (a) Calculate value of $\int_0^{\pi/2} \sin x \, dx$ with $h = \pi/20$ by using Trapezoidal rule and find the error. 8

(b) Solve $\frac{dy}{dx} = 1 + y^2, y(0) = 0$ from $x = 0$ to 1 using Euler's method. Given $h = 0.2$. 8

5. (a) Given $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$

Evaluate y (0.1), correct to four decimal places using Taylor's Series Method. 8

(b) Find the values of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 10.5 from the following data 8

x	10	11	12	13	14
y	15	12.8	10.6	8.5	6.4

Unit–III

6. (a) Calculate first four moments for the following frequency distribution : 8

Marks	:	5-15	15-25	25-35	35-45	45-55	55-65
No. of Students	:	10	20	25	20	15	10

(b) Prove the recursion relation $T_{n+1}(x) = 2xT_n(x) - T_{n-1}(x)$. Also find the first six Chebyshev polynomials. 8

7. (a) Given the following data :

x :	1	2	3	4	5	6	7	8	9
y :	9	8	10	12	11	13	14	16	15

Find (i) regression coefficients (ii) regression lines (iii) coefficient of correlation. 10

(b) Prove that Arithmetic mean of regression coefficients is greater than the coefficient of correlation. 6

Unit–IV

8. (a) Prices of shares of a company on the different days in a month were found to be 66, 65, 69, 70, 69, 71, 70, 63, 64 and 68. Check whether the mean price of the shares in the month is 65 with the help of t-test. 10

(b) Write short note on Seasonal fluctuations and cyclic movement. 6