Total No. of Questions : 9] [Total No. of Printed Pages : 7

(1126)

Bachelor of Computer Applications IIIrd semester (0029) Examination

0923

COMPUTER BASED NUMERICAL AND STATISTICAL METHODS

Paper : BCA-301

Time : 3 Hours] **[Maximum Marks : 90**

Note :– Attempt *five* questions in all, including Question No. **9** in Section–E, which is compulsory and taking *one* each from Section–A, B, C, and D.

Section–A

1. (a) For which x values is there a potential for cancellation in the calculation of y ? Rewrite the expression to compute y in a numerically stable fashion.

$$y = \sqrt{x + \frac{1}{x}} - \sqrt{x - \frac{1}{x}}$$

(b) Perform *three* iterations of Birge-Vieta method to find the smallest positive root of the polynomial $2x^3 - 5x + 1 = 0$. 9,9

2. (a) Find the minimum number of iterations required by the bisection method to guarantee that you can find the root of a function to within an absolute error of 10^{-8} if you know that the root is in the interval (–3, 4).

(b) Consider the root-finding problem $f(x) = x^2 - 5 = 0$. Using $x_0 = 2.00$, use Newton-Raphson Method to find x_1 and x_2. 9,9

Section–B

3. (a) Use Lagrange and the divided difference formula to calculate F(3) from the following table :

X	0	1	2	4	5	6
F(x)	1	14	15	5	6	19

(b) What is numerical integration ? Evaluate $\int_2^{10} \frac{dx}{1+x}$ by dividing the range into 8 equal parts using Trapezoidal rule. 9,9

4. (a) Consider the linear system :

$$\begin{bmatrix} 1 & 2 & 1 \\ -1 & 1 & 0 \\ 2 & 10 & 5 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ 12 \end{bmatrix}$$

Solve the system using Guass Elimination Method.

(b) Calculate $y(0.2)$, given that $\frac{dy}{dx} = x + y,\ y(0) = 1$, taking h + 0.1 by Fourth order Runga-Kutta method. 9,9

Section–C

5. (a) What are measures of central tendency ? What kind of information does each provide ? Explain with suitable examples. Under what circumstances should one use a mean vs. a median to characterize a sample ?

(b) Give an algorithm to compute the mode of a given data. 9,9

6. (a) The following are some particulars of the distribution of weights of boys and girls in a class :

	Boys(x)	Girls(y)
Number	60	80
Mean Weight	55	48
Variance	12	8

Find the standard deviation of the combined data of boys and girls. Which distribution is more consistent ?

(b) Compare and contrast skewness and kurtosis for data analayis. 9,9

Section–D

7. Define correlation between *two* variables. Find the coefficient of linear correlation between the variables X and Y given in the table below :

X	Y
1	1
3	2
4	4

6	4
8	5
9	7
11	8
14	9

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8. Determine the constants a and b by the method of least squares such that $Y = ae^{bX}$ fits the following data :

X	Y
2	4.077
4	11.084
6	30.128
8	81.897
10	222.62

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Section–E

(Compulsory Question)

9. Do the following :

(a) For a general root finding problem, list the following *three* algorithms in order of increasing

speed (whereby faster we mean takes less steps to converge to an answer) :

Secant method, Newton's method, Bisection method

(b) Compute $\frac{1.47+0.0291}{2.62}-0.572$ as it would be done on a machine with 3 digit precision.

(c) Explain primary sources of errors in numerical computations.

(d) What is the concept of pivoting in the context of finding a solution to the system of simultaneous linear equations ?

(e) Define Harmonic Mean.

(f) What is a frequency distribution tale ?

(g) Define Statistcs.

(h) Define regression.

(i) Define moments in Statistics. 9×2=18