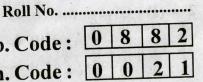
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B.C.A. 3rd Semester

## 1125

# COMPUTER BASED NUMERICAL METHODS Paper-BCA-301

# Time Allowed : Three Hours]

## [Maximum Marks : 90

Note :- Attempt five questions in all, including Q. 9 in Section-E, which is compulsory and taking one each from Sections A, B. C & D.

# SECTION-A

- What do you mean by normalized floating point number? 1. (a) What are the advantages of normalizing floating-point numbers? For x = 0.4845 and y = 0.4800, calculate the value of  $\frac{x^2 - y^2}{x + y}$  by using normalized floating point arithmetic. Compare the result with the value of (x - y). Indicate the error in the former.
  - Explain primary sources of errors in numerical computations. (b) What are various measures that can be taken to eliminate or 9.9 reduce such errors ?

- 2. (a) Given that  $\alpha$  is the only root of the equation  $x^3 - x^2 - 6 = 0$ :
  - (i) Show that  $2.2 < \alpha < 2.3$ .
  - (ii) Taking 2.2 as first approximation to  $\alpha$ , apply Newton-Raphson procedure once to  $f(x) = x^3 x^2 6$  to obtain a second approximation to  $\alpha$ , giving your answer to 3-decimal places.
  - (iii) Use Bisection method once on the interval [2.2, 2.3] to find another approximation to α, giving your answer to 3-decimal places.
  - (b) Perform 2 iterations of the Birge-Vieta method to find the smallest positive root of the equation  $x^4 3x^3 + 3x^2 3x + 2 = 0$ . Use the initial approximation  $p_0 = 0.5$ . 9,9

SECTION-B

3. (a) Using Lagrange's interpolation formula, find y(2) for the following data :

x	1	3	4	6
У	-3	9	30	132

(b) Find the approximate value of  $I = \int_{0}^{1} \frac{dx}{1+x}$  using (i) Trapezoidal

Rule and (ii) Simpson's Rule.

9.9

4. (a) Solve the following system of linear equations by Gauss-Seidal's method correct up to three decimal places :

3x + y + z = 3; 2x + y + 5z = 5; x + 4y + z = 2.

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(b) Using Gauss-Jordan method, find the inverse of the following matrix :

1	2	3	1
3	. 2	1	
2	1	3 1 3	

9,9

## SECTION-C

 (a) A medical research team studied the ages of patients who had strokes caused by stress. The ages of 34 patients who suffered stress strokes were as follows :

29 30 36 41 45 50 57 61 28 50 36 58 60 38 36 47 40

32 58 46 61 40 55 32 61 56 45 46 62 36 38 40 50 27

Construct a frequency distribution for these ages. Use 8 classes beginning with a lower class limit of 25.

(b) Find the missing frequency M for the following distribution whose mean is 15 :

x	5	10	15	20	25	
f	6	M	6	10	5	

- (c) Find the median of the data : 19, 25, 59, 48, 35, 37, 30, 32 and 51. If 25 is replaced by 52, then what will be the new median?
  6,6,6
- 6. Explain the following in Statistics with examples :
  - (a) Dispersion and its measures
  - (b) Skewness and Kurtosis and their measures. 9,9

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### SECTION-D

7. Fit a parabola  $Y = a + bx + cx^2$  (by the method of least squares) to the following data :

x	1	2	3	4	5	
у	8	10	15	21	30	18

8. What is regression analysis ? For 10 observations on price (x) and supply (y), the following data were obtained in appropriate units :

 $\Sigma x = 130$ ,  $\Sigma y = 220$ ,  $\Sigma x^2 = 2288$ ,  $\Sigma y^2 = 5506$  and  $\Sigma xy = 3467$ . Obtain two lines of regression and estimate the supply when the price is 16 units. 18

## SECTION—E (Compulsory Question)

- 9. Do the following :
  - (a) An approximate value of  $\pi$  is given by 3.1428571 and its true value is 3.1415926. Find the absolute and relative errors.
  - (b) Define order of convergence of iterative methods. What is order of convergence of false-position method?
  - (c) Define the meaning of approximate solution to the ordinary linear differential equation. Name any two methods for solving this.
    - (d) What do you mean by ill-conditioned system of linear equations? Explain.
  - (e) Define the concept of pivoting in the context of finding a solution to the system of simultaneous linear equations.
  - (f) If the regression coefficients are 0.8 and 0.2, what would be the value of Correlation Coefficient ?
  - (g) What is correlation analysis between two variables?

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- (h) How is Mode different from Harmonic Mean?
- (i) Define moments in Statistics.

9×2=18

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