$$\begin{bmatrix} \dfrac{22}{A\text{-}32} \end{bmatrix}$$

SARDAR PATEL UNIVERSITY
BCA SEMESTER-IV EXAMINATION
Monday, 4th April, 2016
10.30 A.M. to 01.30 P.M.
COMPUTER BASED NUMERICAL AND STATISTICAL METHODS
(US04FBCA01)

<u>Note: Scientific calculator is allowed.</u>   **Total Marks: 70**

Q.1   **Choose the correct option for each of the following:**   **[10]**

1.   The number 0.01850×10^3 has _____ significant digits
     (a) 3   (b) 6   (c) 5   (d) 4

2.   All the formulae of interpolation are based on the fundamental assumption that the given data can be expressed as a __ .
     (a) Polynomial (b) Equation   (c) Algorithm   (d) None of the above

3.   The system of linear equation AX = B can be solved by matrix inversion method only if...
     (a) $A \neq 0$ (b) $|A| \neq 0$ (c) $|A| = 0$ (d) A is symmetric

4.   We can find solution of system of linear, algebraic equations using .
     (a) Gauss-Seidel method   (b) Bisection method
     (c) Newton-Raphson method   (d) None of these

5.   From the following _____ method is not iterative method.
     (a) False position   (b) Bisection   (c) Lagranges   (d) none of them

6.   The second order differences is denoted by _____.
     (a) Δ^2 (b) ∇^3 (c) φ^2 (d) y^3

7.   To estimate the value of dependent variable x for a given value of independent variable y, the process is known as _____.
     (a) Extrapolation   (b) Inverse Interpolation   (c) Interpolation   (d) polynomial

8.   From the following _____ method is the best method to obtain root of equation f(x)=0.
     (a) False position   (b) Bisection   (c) Newton's Raphson   (d)none of them

9.   A forecast with a time horizon of about 3 months to 3 years is typically called a _____.
     (a) long-range forecast   (b) medium-range forecast
     (c) short-range forecast   (d) weather forecast

10. Secular trend is indicative of long-term variation towards:
     (a) increase only   (b) decrease only
     (c) either increase or decrease   (d) none of the above

Q.2   **Attempt any ten:**   **[20]**
1.   Use the False Position method to obtain approximate solution of the equation $X^3 - 9x + 1 = 0$.
2.   Find the next iterative value of the root of using secant method, if the initial guesses are 3 and 4.

3. Define Relative error and absolute error.
4. Explain divided difference method.
5. Write different methods of Interpolation.
6. If x lies in the lower half of the table and if $x = x_k$, then what is $\dfrac{dy(x)}{dx}$ and $\dfrac{d^2 y(x)}{dx^2}$?
7. List only various direct and iterative methods.
8. Define Interpolation and Extrapolation.
9. Differentiate between linear and non linear trend.
10. List the component of Time series.
11. Write a note on Forecasting by the use of Time Series Analysis.
12. Write the following system of equations in matrix form.
$3x + y - z = 10, \quad x + 5y + 2z = 18, \quad x + 4y + 9z = 16$

Q.3[A] Write algorithm for iterative method. [3]
[B] Using Bisection method, find the approximate root of the non-linear equation $x^3 - 4x - 9 = 0$ [7] correct up to three decimal places.

OR

Q.3 Using Secant method, find the approximate root of the equation $\cos x - xe^x = 0$ correct up to [10] 3 decimal places.

Q.4[A] The following table gives the census population of a town for the years 1931 to 1971. [5] Estimate the population for the year 1965 by using an appropriate interpolation formula.

Year	1931	1941	1951	1961	1971
Population	46	66	81	93	101

[B] Estimate by Newton's method of interpolation, the expectation of life at age 32 from the [5] following table.

Age (In Years)	10	15	20	25	30	35
Expectation of life (In Year)	35.3	32.4	29.2	26.1	23.2	20.5

OR

Q.4[A] Apply Newton's divided difference method to find the no. of persons getting Rs. 6 from the [4] following data.

Income per day	3	5	7	8	10
No. of persons	180	154	120	110	90

[B] By using Lagrange's method, estimate the no. of persons whose income is Rs. 19 and more [6] but does not exceed Rs. 25 from the following table.

Income in Rs.	1 and not exceeding 9	10 and not exceeding 19	20 and not exceeding 28	29 and not exceeding 37	38 and not exceeding 46
No. of persons	50	70	203	406	304

Q.5[A] Solve the following system of equations using Gauss-Seidel method. [6]
$x_1 + 2x_2 + x_3 = 0; \ 3x_1 + x_2 - x_3 = 0; \ x_1 - x_2 + 4x_3 = 3$
[B] Write the comparison between direct and iterative methods for solution of system of linear [4] equations.

Q.5[A] The distance (s) covered by a car in given time (t) is given in the following table   [4]

Time(Miutes)	10	12	14	16	18
Distance(km)	12	15	20	27	37

Determine the acceleration of the car at t = 13 minutes.

[B] Given the following table   [6]

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

Estimate the value of $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$ at 10, 10.5, 11, 11.2 using the forward difference formula.

Q.6[A] Obtain seasonal indices using simple average method.   [6]

Year	Q-1	Q-II	Q-III	Q-IV
1974	30	81	62	119
1975	33	104	86	171
1976	42	153	99	221
1977	56	172	129	235

[B] Explain/Write steps of 'Ratio to moving Average' Method.   [4]

Q.6[A] Obtain the trend from the time series given below by method of moving average of 4 years   [6]

Year	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
Y	50.0	36.5	43.0	44.5	38.9	38.1	32.6	41.7	41.1	33.8

[B] What is time series? Explain Secular Trend.   [4]

******** *ALL THE BEST* *********