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Bachelor of Commerce IIIrd Semester (0013) Examination

0820

BUSINESS MATHEMATICS AND STATISTICS

(BCM : 304)

Time : 3 Hours]

[Maximum Marks : 80

Note :– Attempt any *four* questions from Section A. Attempt *two* questions from Section B and C.

Section–A

1. Attempt any *four* questions :

   (i) Explain uses of index numbers. Explain the cost of living index numbers. Mention the tests of index number.

   (ii) The demand for a product is represented by the equation :

   $$p = (20 + 5x - x^2)$$

   where x is the number of units demanded and p is the price per unit. Determine the marginal revenue at $x = 2$.

(iii) From the following data, calculate the measure of skewness using the mean, median and standard deviation :

X	f
10—20	18
20—30	30
30—40	40
40—50	55
50—60	38
60—70	20
70—80	16

(iv) Define the following :

(a) Properties of determinants

(b) Inverse of a matrix

(c) Adjoint of a matrix (3, 1, 1)

(v) Find the rank of the matrix :

$$A = \begin{bmatrix} 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \\ 2 & 3 & -1 & -1 \end{bmatrix}$$

(vi) Explain the objectives of the analysis of a time series. How does time series help in making business forecast ? Explain its role and limitation. 4×5=20

Section–B

2. (a) Find the inverse of :

$$\begin{bmatrix} 2 & -2 & 3 \\ 1 & 0 & -3 \\ 3 & 4 & 0 \end{bmatrix}$$

by matrix reduction method.

(b) Apply rank test to examine if the following system of equation is consistent and if consistent, find the complete solution :

$$x + y + z = 6$$
$$x + 2y + 3z = 10$$
$$x + 2y + 4z = 1$$

5,10

3. Find the derivatives of the following functions :

(i) $\dfrac{(x^2+4)(x-1)}{3x^2+5x+10}$ (ii) $\dfrac{(x^2+1)^2}{(2x^2-1)}$

(iii) $x^4.e^{\log x^3}$ (iv) $x^2.e^x$

5,5,3,2

4. Answer the following questions :

Define the following terms :

(i) Differentiate between square matrix, diagonal matrix, scalar matrix, identity matrix.

(ii) Inverse of matrix is unique. Give an example to prove it.

(iii) Using the properties of determinants prove that :

$$\begin{bmatrix} a^2 & bc & ac+c^2 \\ a^2+ab & b^2 & ac \\ ab & b^2+ac & c^2 \end{bmatrix} = 4a^2b^2c^2$$

(iv) Give a square matrix A of order 3 × 3, such that |A| = –5, find the value of |A. adj A|.

(v) If a matrix A has 11 elements, what is its possible order ?

4,2,6,2,1

5. Find the maximum and the minimum (if they exist) of the following functions for all real x where they are defined. Are the extrema attained or only limiting values ?

(a) $f(x) = 3x^4 - 4x^3$

(b) $f(x) = x^3 + 3x^2 + 4x + 5$

(c) $f(x) = \dfrac{x}{x^2+4}$

(d) $f(x) = \dfrac{x^2}{x^2+4}$

(e) $f(x) = \dfrac{x^2}{x^3+4}$

3×5=15

Section–C

6. (a) Explain the term 'Classification' and 'Tabulation'. What are the uses of two ?

(b) Distinguish between primary and secondary data. What are the methods of collecting primary and secondary data ?

(c) The profits (in lakhs of rupees) of 30 companies for the year 1999-2000 are given below :

20, 22, 35, 42, 37, 42, 48, 53, 49, 65, 39, 48, 67, 18, 16, 23, 37, 35, 49, 63, 65, 55, 45, 58, 57, 69, 25, 29, 58, 65

Classify the above data taking a suitable class interval. 2,6,7

7. (a) What are the essential requisites of a good measure of central tendency ?

(b) What are the properties of a good measure of dispersion ? Distinguish between absolute and relative measures of dispersion.

(c) What are the uses of Lorenz curve ?

(d) For a group of 50 male workers, the mean and standard deviation of their daily wages are Rs. 63 and Rs. 9 respectively. For a group of 40 female workers, these are Rs. 54 and Rs. 6 respectively. Find the standard deviation of daily wages for the combined group of 90 workers. 2,3,2,8

8. Answer the following questions :

(a) Fit a straight line trend by the method of least squares to the following data and find the trend values :

Year	Sales of Airconditioners (in lakhs)
2003	10
2004	13
2005	16
2006	21
2007	24
2008	30

(b) Explain the method of mover moving Averages in estimating the trend of a time series. What are the advantages and disadvantages in using this method ? 12,3

9. Answer the following questions :

(a) Explain the following :

(i) Time reversal test

(ii) Base shifting

(iii) Quantity index

(b) For the following data, calculate price index number of 2008 with 2007 as the base year, using :

(i) Laspeyre's method

(ii) Fisher's method

	2007		2008	
	Price	Quantity	Price	Quantity
A	20	8	40	6
B	50	10	60	5
C	40	15	50	15
D	20	20	20	25

3,12