DBZ-003-1032004   Seat No. _____

B. C. A. (Sem. II) (CBCS) (W.E.F. 2016) Examination

July - 2022

CS-10 : Mathematical & Statistical Foundation of Computer Science

(Old Course)

Faculty Code : 003
Subject Code : 1032004

Time : $2\frac{1}{2}$ Hours]   [Total Marks : **70**

Instruction : Answer all the questions.

1   (a)   Answer the following questions in brief :   **4**

   (1)   Find the value of determinant $\begin{vmatrix} a & b \\ c & d \end{vmatrix}$.

   (2)   The value of a determinant is unchanged if its corresponding rows and columns are interchanged. (True or False)

   (3)   How many elements in a 3×3 determinant ?

   (4)   Determinant of a matrix A is denoted by _____.

   (b)   Attempt any **one** out of two :   **2**

   (1)   If $A = \begin{bmatrix} -1 & -1 \\ 0 & 9 \end{bmatrix}$ then find $|A|$.

   (2)   If $D = \begin{vmatrix} 1 & 2 & 3 \\ 4 & 8 & 12 \\ 5 & 14 & 9 \end{vmatrix}$ then find the value of D.

   (c)   Attempt any **one** out of two :   **3**

   (1)   Solve : $2x + y - 3 = 0, 2x + 3y - 5 = 0$ by Crammer's rule.

   (2)   If $A = \begin{vmatrix} 1 & 2 & 1 \\ 2 & k & 2 \\ -3 & 2 & 1 \end{vmatrix} = 0$ then find k.

(d) Attempt any **one** out of two : 5

    (1) Explain any two properties of determinants.

    (2) Solve : $3x + 2y - z - 4 = 0$, $2x + y - 1z - 2 = 0$, $x + 2y - 2z - 1 = 0$ by Crammer's rule.

2 (a) Answer the following questions in brief : 4

    (1) Define Diagonal matrix.

    (2) Define Sub matrix.

    (3) Define Symmetric matrix.

    (4) Define Null matrix.

(b) Attempt any one out of two : 2

    (1) If $A = \begin{bmatrix} 3 & 4 \\ -1 & -6 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 0 \\ 0 & 0 \end{bmatrix}$ then find $A + B$ and $A - B$.

    (2) If $A = \begin{bmatrix} 3 & 1 & 3 \\ 2 & 1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 & 1 \\ 2 & 3 & 0 \end{bmatrix}$ then find $A + B$.

(c) Attempt any **one** out of two : 3

    (1) If $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$ then show that $A^3 = 4A$.

    (2) If $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ then find adj A.

(d) Attempt any **one** out of two : 5

    (1) Find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$.

    (2) If $A = \begin{bmatrix} -4 & -3 & -3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{bmatrix}$, then show that adj $A = A$.

3 (a) Answer the following questions in brief :   **4**
(1) Find the distance between two points (1, 2) and (–3, 5).
(2) Define Intersection of two sets.
(3) Find the midpoint of line segment joining points A(2, 3) and B(2, 1).
(4) Define power set.

(b) Attempt any **one** out of two :   **2**
(1) If the distance between two points A(1, 2) and B(x, 5) is 5 then find x.
(2) Define Cartesian products of two sets with example.

(c) Attempt any **one** out of two :   **3**
(1) Prove that the triangle with vertices at the points (4, 2), (2, 2) and (4, 4) is right angled.
(2) If A = {1, 2, 3, 4}, B = {1, 3, 4}, C = {1} then prove that $A \times (B \cap C) = (A \times B) \cap (A \times C)$.

(d) Attempt any **one** out of two :   **5**
(1) Explain De'Morgan laws with logical proof.
(2) Find the area of the triangle whose vertices are A(–323), B(1, –2) and C(5, 6).

4 (a) Answer the following questions in brief :   **4**
(1) Find mean for the data 3, 6, 4, 7, 5, 4, 5, 6.
(2) Define Range.
(3) Define Mode.
(4) Define Median.

(b) Attempt any **one** out of two :   **2**
(1) For the data 2, 3, 5, 9, 8, 11, 5, 14, 5, 8. Find Mode.
(2) For the data 1, 3, 6, 8, 8, 10, 5, 11, 7, 8. Find Mode.

(c) Attempt any **one** out of two :   **3**
(1) Calculate the mean for the following frequency distribution.

x	150–155	155–160	160–165	165–170	170–175	175–180	180–185
f	8	10	20	17	15	4	1

(2) Calculate the median for the following frequency distribution.

Class	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35	35 – 40	40 – 45
f	5	6	15	10	5	4	2	2

(d) Attempt any **one** out of two :   **5**

(1) Calculate the standard deviation for the following table.

Class	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50
Frequency	170	110	80	45	40	35

(2) The median and mode of the following wage distribution are known to be Rs. 33.50 and Rs. 34 respectively. Find the value of k.

Wages: in (Rs.)	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	Total
Frequency	6	16	k	100	40	6	4	230

5 (a) Answer the following questions in brief :   **4**
(1) Define Sequence.
(2) Define Arithmetic Progression.
(3) If 1, 4, 7, 10, _____ is a sequence then find its 10th term.
(4) In A.P., T_n = _____

(b) Attempt any **one** out of two :   **2**
(1) If the sum of an A.P. is $2n^2 + 3n$ then find its 20th term.
(2) For an A.P. $T_5 = 10$ and $T_{10} = 40$ then find T_{20}.

(c) Attempt any **one** out of two :   **3**
(1) If the tenth term of AP is 5/2 and its first term is 19/4 then find d.
(2) Find the sum of first 100 natural numbers.

(d) Attempt any **one** out of two :   **5**
(1) Find the sum of all natural numbers between 200 and 400 which are divisible by 7.
(2) Find three numbers in G.P, such that their product is 216 and their sum is 26.