XII CORE ASSIGNMENT-1

CHAPTER - RELATIONS AND FUNCTIONS, MATRICES AND DETERMINANTS

1. A relation R on a set A is said to be an equivalence relation on A iff it is
   - Reflexive i.e., (a , a)$\in R\ \ \forall$ a, b $\in A$.
   - Symmetric i.e., (a , b)$\in R \implies (b, a) \in R\ \ \forall$ a, b $\in A$
   - Transitive i.e., (a , b)$\in R\ and\ (b, c) \in R \implies (a, c) \in R\ \ \forall$ a, b $\in A$.

Based on the above information, answer the following questions.

(i) If the relation R = { (1, 1), (1, 2), (1, 3), (2, 2), (2, 3), (3, 1), (3, 2), (3, 3) } defined on the set A = { 1, 2, 3}, then R is

(a) Reflexive (b) symmetric (c) transitive (d) Equivalence

(ii) If the relation R = { (1, 2), (2, 1), (1, 3), (3, 1) } defined on the set A = { 1, 2, 3 }, then R is

(a) Reflexive (b) symmetric (c) transitive (d)Equivalence

(iii) If the relation R on the set N of all natural numbers defined as R = { (x, y): y = x + 5 and x < 4}, then R is

(a) Reflexive (b) symmetric (c) transitive (d)Equivalence

(iv) If the relation R on the set A = { 1, 2, 3, …., 13, 14 } defined as R = { (x, y): 3x – y = 0 }, then R is

(a) Reflexive (b) symmetric (c) transitive (d)Equivalence

(v) If the relation R on the set A = { 1, 2, 3 } defined as R = { (1, 1), (1, 2), (1, 3), (2, 1), (2, 2), (2, 3), (3, 1), (3, 2), (3,3)} then R is

(a) Reflexive only (b) symmetric only

(c) Transitive only (d) equivalence

2. Consider the mapping : f : A→ B is defined by f(x) = $\frac{x-1}{x-2}$ such that f is a bijection.

Based on the above information, answer the following questions.

(i)Domain of f is

(a) R – {2} (b) R (c) R – {1, 2} (d) R – {0}

(ii)Range of f is

(a) R (b) R – {1} (c) R – {0} (d) R – { 1, 2}

(iii) If g : R – {2} → $R-\{1\} is\ defined\ by\ g(x)=2f(x)-1, then$ g(x) in terms of x is

(a) $\frac{x+2}{x}$ (b) $\frac{x+1}{x-2}$ (c) $\frac{x-2}{x}$ (d) $\frac{x}{x-2}$

(iv) the function g defined above, is

(a) One- One (b) Many – One (c) into (d) None of these

(v) A function f(x) is said to be one- one iff

(a) f$(x_1) = f(x_2) \Longrightarrow -x_1 = x_2$

(b) f$(-x_1) = f(-x_2) \Longrightarrow -x_1 = x_2$

(c) f$(x_1) = f(x_2) \Longrightarrow x_1 = x_2$

(d) none of these

3. Sherlin and Danju are playing playing Ludo at home during covid-19. While rolling the dice, Sherlin's sister Raji observed and noted that the possible outcomes of the throw every time belongs to set {1,2,3,4,5,6}. Let A be the set of players while B be the set of all possible outcomes.

A = {S, D}, B = {1,2,3,4,5,6}

(i)Let $R : B \to B$ be defined by R = $\{(x, y): y \text{ is divisible by } x\}$ is

(a)Reflexive and transitive but not symmetric
(b) Reflexive and symmetric and not transitive
(c) Not reflexive but symmetric and transitive
(d) Equivalence

(ii) Raji wants to know the number of functions from A to B. How many number of functions are possible?

(a) 6^2 (b) 2^6 (c) 6! (d) 2^{12}

(iii) Let R be a relation on B defined by R = {(1,2), (2,2), (1,3), (3,4), (3,1), (4,3), (5,5)}. Then R is

(a) Symmetric (b) Reflexive

(c) Transitive (d) None of these three

(iv) Raji wants to know the number of relations possible from A to B. How many numbers of relations are possible?

(a) 6^2 (b) 2^6 (c) 6! (d) 2^{12}

(v) Let $R: B \to B$ be defined by R={(1,1),(1,2), (2,2), (3,3),(4, 4), (5, 5), (6, 6)}, then R is

(a) Symmetric (b) Reflexive and transitive

(c)Transitive and Symmetric (d) Equivalence

4. Students of Grade 9, planned to plant saplings along straight lines, parallel to each other to one side of the playground ensuring play area. Let us assume that they planted one of the rows of the saplings along the line y = x – 4. Let L be the set of all lines which is parallel to the ground and R be a relation on L.

Answer the following using the above information.

(i)Let relation R be defined by R = {(L_1, L_2): $L_1 \| L_2$ where $L_1, L_2 \in L$

(a) Equivalence
(b) Only reflexive
(c) Not reflexive
(d) Symmetric but not transitive

(ii) Let R = { ($L1$, $L2$) : $L1 \perp L2$ where L1, L2 € L } which of the following is true?

(a) R is Symmetric but neither reflexive nor transitive
(b) R is Reflexive and transitive but not symmetric
(c) R is Reflexive but neither symmetric nor transitive
(d) R is an Equivalence relation

(iii) The function f: R→R defined by $f(x) = x - 4$ is____________.

(a) Bijective
(b) Surjective but not injective
(c) Injective but not Surjective
(d) Neither Surjective nor Injective

(iv) Let $f: R \to R$ be defined by $f(x) = x - 4$. Then the range of $f(x)$ is ________.

(a) R (b) Z (c) W (d) Q

(v) Let R = {(L_1, L_2) : L_1 is parallel to L_2 and L_1 : y = x – 4} then which of the following can be taken as L_2

(a) 2x – 2y + 5 = 0 (b) 2x + y = 5

(c) 2x + 2y +7 = 0 (d) x + y = 7

5. If A = $[a_{ij}]_{m\times n}$ and B = $[b_{ij}]_{m\times n}$ are two matrices, then A $\pm B$ is Order of m$\times n$ and is defined as (A $\pm B) = a_{ij} \pm b_{ij}$, where i = 1, 2, 3,…..,m and j = 1, 2,…..,n

If A = $[a_{ij}]_{m\times n}$ and B = $[b_{ij}]_{n\times p}$ are two matrices, then AB is

Order of m$\times p$ and is defined as

$(AB)_{ik} = \sum_{r=1}^{n} a_{ik}b_{kj} = a_{i1}b_{1k} + a_{i2}b_{2k} + \ldots + a_{in}b_{nk}$

$Consider\ A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$, B = $\begin{bmatrix} 5 & 2 \\ 7 & 4 \end{bmatrix}$, C = $\begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix}$ and D = $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$

Using the concept of matrices answer the following questions.

(i) Find the product of AB

(a) $\begin{bmatrix} 3 & 0 \\ 43 & 22 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 3 \\ 22 & 43 \end{bmatrix}$ (c) $\begin{bmatrix} 43 & 22 \\ 0 & 3 \end{bmatrix}$ (d) $\begin{bmatrix} 22 & 43 \\ 3 & 0 \end{bmatrix}$

(ii) If A and B are any other two matrices such that AB exists, Then

(a) BA does not exists (b) BA will be equal to AB

(c) BA may or may not be exist (d) None of these

(iii) Find the values of a and c in the matrix D such that

CD – AB = 0.

(a) a = 77, c = -191 (b) a = -191, c = 77

(c)a = 191, c = 77 (d) a = 91, c = 70

(iv) find the values of b and d in the matrix D such that

CD – AB = 0.

(a) b = 44, d = -110 (b) b = 110, d = 4

(c)b = -110, d = 44 (d) b = -44, d = 110

(v) Find B + D.

(a) $\begin{bmatrix} 80 & 200 \\ 115 & 105 \end{bmatrix}$ (b) $\begin{bmatrix} 84 & 48 \\ 180 & 181 \end{bmatrix}$

(c) $\begin{bmatrix} 186 & 108 \\ -84 & -48 \end{bmatrix}$ (d) $\begin{bmatrix} -186 & -108 \\ 84 & 48 \end{bmatrix}$

6. A trust fund Rs. 35000 that must be invested in two different types of bonds, say X and Y. The first bond pays 10 % interest p.a. which will be given to an old age home And second one pays 8 % interest p.a. which will be given to WWA (Women Welfare Association).

Let A be a 1×2 matrix and b be a 2×1 matrix, bond respectively.

respectively.

Based on the above information, answer the following questions.

(i) If ₹ 15000 is invested in bond X, then

(a) $A = \begin{matrix} X \\ Y \end{matrix}\overset{\text{Investment}}{\begin{bmatrix} 15000 \\ 20000 \end{bmatrix}}$; $B = \begin{matrix} X & Y \\ [0.1 & 0.08] \end{matrix}$ Interest rate

(b) $A = \text{Investment} \begin{matrix} X & Y \\ [15000 & 20000] \end{matrix}$; $B = \begin{matrix} X \\ Y \end{matrix}\overset{\text{Interest rate}}{\begin{bmatrix} 0.1 \\ 0.08 \end{bmatrix}}$

(c) $A = \text{Investment} \begin{matrix} X & Y \\ [20000 & 15000] \end{matrix}$; $B = \begin{matrix} X \\ Y \end{matrix}\overset{\text{Interest rate}}{\begin{bmatrix} 0.08 \\ 0.1 \end{bmatrix}}$

(d) None of these

(ii) If Rs. 15000 is invested in bond X, then the total Amount of interest received on both is

(a) Rs. 2000 (b) Rs. 2100 (c) Rs. 3100 (d) Rs. 4000

(iii) If the trust fund obtains an annual total interest of Rs.3200, then the investment in two bonds is

(a) Rs. 15000 in X, Rs. 20000 in Y

(b)Rs. 17000 in X, Rs. 18000 in Y

(c)Rs. 20000 in X, Rs. 15000 in Y

(d) Rs. 18000 in X, Rs. 17000 in Y

(iv) The total amount of interest received on both bonds is given by

(a) AB (b) A'B (c) B'A (d) None of these,

(v)If the amount of interest given to old age home is Rs. 500, then the amount of investment in bond Y is

(a)Rs.20000 (b)Rs.30000 (c)Rs.15000 (d)Rs.25000

7. A manufacturer produces three types of bolts x, y and z which he sells in two markets. Annual sales (in Rs.) are Indicated below:

Markets	Products		
	x	y	z
I	10000	2000	18000
II	6000	20000	8000

If the units prices of x, y and z are Rs. 2.50, and Rs. 1.50 and Rs. 1.00 respectively, then answer the following questions using the concept of matrices.

(i)Find the total revenue collected from the market – I.

(a)Rs. 44000 (b) Rs. 48000 (c) Rs. 46000 (d)Rs.53000

(ii)Find the total revenue collected from the market – II.

(a)Rs. 51000 (b) Rs. 53000 (c) Rs.46000 (d)Rs.49000 (iii)If the unit costs of the above three commodities are Rs. 2.00, Rs. 1.00 and 50 paise respectively, then find the gross profit from both the markets.

(a) Rs.53000 (b)Rs. 46000 (c) Rs.34000 (d)Rs.32000

(iv) IF matrix A = $\left[a_{ij}\right]_{2\times 2}$, where a_{ij}=1, if i $\neq j$ and $a_{ij} = 0$ if i = j, then A^2 is equal to

(a) I (b) A (c) O (d) none of these

(v) If A and B are matrices of same order, then (AB'-BA') is a

(a) skew-symmetric matrix (b) null matrix

(c)symmetric matrix (d) unit matrix

8. Area of a triangle whose vertices are (x_1, y_1), (x_2, y_2) And (x_3, y_3) is given by the determinant

$$\Delta = \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$

Since, area is a positive quantity, so we always take the absolute value of the determinant Δ. Also, the area of the Triangle formed by three collinear points is zero.

Based on the above information, answer the following questions.

(i)Find the area of the triangle whose vertices are (-2, 6), (3, -6) and (1, 5).

(a) 30 sq. units (b) 35 sq. units

(c)40 sq. units (d) 15.5 sq. units

(ii) If the points (2, -3), (k, -1) and (0, 4) are collinear, then

Find the value of 4k.

(a) 4 (b) $\frac{7}{140}$ (c) 47 (d) $\frac{40}{7}$

(iii) If the area of a triangle ABC, with vertices A(1, 3), B(0, 0) and C(k, 0) is 3 sq. units, then a value of k is

(a) 2 (b) 3 (c) 4 (d) 5

(iv) Using determinants, find the equation of the line Joining the points A(1, 2) and B(3, 6).

(a) y = 2x (b) x = 3y (c) y = x (d) 4x – y = 5

(v) If A ≡ (11, 7), B ≡ $(5, 5)$ $and\ C \equiv (-1, 3), then$

(a) $\Delta ABC\ is\ scalene\ triangle$

(b) $\Delta ABC\ is\ equilateral\ triangle$

(c) A, B and C are collinear

(d) None of these

9. Two institutions decided to award their employees for three values of resourcefulness, competence and determination in the form of prizes at the rate of Rs. x ,Rs. y, Rs. z respectively per person. The first institution decided to award respectively 4,3 and 2 employees with a total prize money of Rs. 3700 and second institution decides to award respectively 5,3 and 4 employees with a total prize money of Rs. 4700. All the three prizes per person together amount to Rs. 12000.

Based on the above information, answer the following

Questions :

(i)The model linear equations representing the above information are

(a) $4x + 3y + 2z = 37000$
$5x + 3y + 4z = 47000$
$x + y + z = 12000$

(b) $5x + 3y + 4z = 37000$
$4x + 3y + 2z = 27000$
$x + y + z = 12000$

(c) $4x + 5y + z = 47000$
$3x + 3y + z = 37000$
$2x + 4y + z = 12000$

(d) none of these

(ii) The value of the determinant $\begin{vmatrix} 4 & 3 & 2 \\ 5 & 3 & 4 \\ 1 & 1 & 1 \end{vmatrix}$ is

(a) -1 (b) 3 (c) -3 (d) -5

(iii) The linear equations representing the given Information has

(a) unique solution (b) three solution

(c)infinitely many solutions (d) no solution

(iv) Using matrix method, the value of x (in Rs) is

(a)5000 (b) 3000 (c) 4500 (d) 4000

(v) Using matrix method, the value of y and z (in Rs.) respectively are

(a)3000, 5000 (b) 5000, 3000

(c) 4000, 5000 (d)5000, 4000

10. Let A = $\begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$, and $U_{1,} U_2$ are first and second columns respectively of 2× 2 matrix U. Also, let the column matrices U_1 and U_2 satisfying A$U_1 = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ and A$U_2 = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$.

(i)the matrix $U_1 + U_2$ is equal to

(a) $\begin{bmatrix} 1 \\ -1 \end{bmatrix}$ (b) $\begin{bmatrix} 2 \\ -2 \end{bmatrix}$ (c) $\begin{bmatrix} 3 \\ -3 \end{bmatrix}$ (d) $\begin{bmatrix} 4 \\ -4 \end{bmatrix}$

(ii)The value of |U| is

(a) 3 (b) -3 (c) 2 (d) -2

(iii) If X = $\begin{bmatrix} 3 & 2 \end{bmatrix}$ U $\begin{bmatrix} 3 \\ 2 \end{bmatrix}$, then the value of |X|=

(a) 3 (b) -3 (c) -5 (d) 5

(iv) The minor of element at the position a_{22} in U is

(a) 1 (b) 2 (c) -2 (d) -1

(v) If U = $\left[a_{ij}\right]_{2\times 2}$, then the value of $a_{11}A_{11} + a_{12}A_{12}$,
Where A_{ij} denote the factor of a_{ij}, is

(a) 1 (b) 2 (c) -3 (d) 3