



# INDIAN SCHOOL MUSCAT

## FIRST PERIODIC TEST-2023

### MATHEMATICS

CLASS: XII

Sub.Code: 041

Time Allotted: 50mts.

13.04.2023

Max .Marks: 20

#### GENERAL INSTRUCTIONS:

1. This Question paper contains **four sections** A, B, C and D. Each section is compulsory.
2. **Section A** has 3 **MCQ's** and 1 Assertion- Reasoning question of 1 mark each.
3. **Section B** has 3 **Very Short Answer (VSA)** type questions of 2 marks each.
4. **Section C** has 2 **Short Answer (SA)** type questions of 3 marks each.
5. **Section D** has 1 **Source based/Case based Question** carrying 4 marks.

#### SECTION – A (4 x 1 = 4 marks)

1. The order of the matrix  $\begin{bmatrix} 2 \\ -1 \\ 4 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \\ 5 \end{bmatrix}^T$  is 1  
 (a)  $1 \times 3$                       (b)  $1 \times 1$                       (c)  $3 \times 3$                       (d)  $3 \times 1$
2. If  $A$  is a square matrix such that  $A^2 = A$ , then the value of  $7A - (I + A)^3$  is 1  
 (a)  $A$                       (b)  $I$                       (c)  $O$                       (d)  $-I$
3. If  $A$  is a skew symmetric matrix of order 3, then the value of  $5a_{12} + 6a_{22} - 5a_{21}$  is 1  
 (a) 1                      (b) 0                      (c)  $-10a_{12}$                       (d)  $-10a_{21}$
4. In the following question, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Choose the correct answer out of the following choices. 1  
 (a) Both A and R are true and R is correct explanation for A.  
 (b) Both A and R are true but R is not correct explanation for A.  
 (c) A is true but R is false.  
 (d) A is false but R is true.

**Assertion (A):** The Signum function  $f: R \rightarrow R$  given by  $f(x) = \begin{cases} 1, & \text{if } x > 0 \\ 0, & \text{if } x = 0 \\ -1, & \text{if } x < 0 \end{cases}$

is a bijection.

**Reason(R):** A function is said to be a bijection, if it is both one-one and onto.

#### SECTION – B (3 x 2 = 6 marks)

5. Find matrix  $A$ , if  $A - B = \begin{bmatrix} 2 & 0 \\ 4 & -2 \end{bmatrix}$  and  $A + 2B = \begin{bmatrix} 0 & 2 \\ 0 & 4 \end{bmatrix}$  1
6. Construct a  $3 \times 3$  matrix given by  $a_{ij} = \begin{cases} 2i + 3j, & i < j \\ 5, & i = j \\ 3i - 2j, & i > j \end{cases}$  1
7. Show that the relation  $R$  in the set  $A = \{1, 2, 3\}$  given by  $R = \{(1, 1), (2, 2), (3, 3), (1, 2), (2, 3)\}$  is reflexive but neither symmetric nor transitive. 1

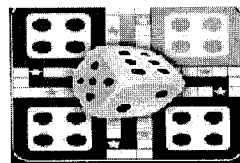
#### SECTION – C (2 x 3 = 6 marks)

8. Prove that the function  $f: N \rightarrow N$  defined by  $f(x) = x^2 + x + 1$  is injective but not surjective. 3
9. Find matrix  $X$  such that  $\begin{bmatrix} 2 & -1 \\ 1 & 0 \\ -3 & 4 \end{bmatrix} X = \begin{bmatrix} -1 & -8 \\ 1 & -2 \\ 9 & 22 \end{bmatrix}$  3

#### SECTION – D CASE STUDY QUESTION (4 marks)

10. Priya, Surya and Chandrika are playing Ludo. While rolling the dice, they noted that the possible outcome of the throw every time belongs to the set  $\{1, 2, 3, 4, 5, 6\}$ . Let  $A$  denote the set of players and  $B$  be the set of all possible outcomes.

Then,  $A = \{P, S, C\}$ ,  $B = \{1, 2, 3, 4, 5, 6\}$



Based on the given information, answer the following questions:

(i) How many one-one functions can be defined from  $A$  to  $B$ ? (1)

(ii) If  $R_1 = \{(P, C), (S, S), (C, S)\}$  be a relation defined on  $A$ , then find the minimum ordered pairs which should be added in  $R_1$  to make it reflexive and symmetric. (1)

(iii) Check if the relation  $R_2$  on the set  $B$  defined as  $R_2 = \{(x, y): y \text{ is divisible by } x\}$  is

(a) symmetric (b) transitive (2)

(OR)

(iv) Check whether  $f: B \rightarrow B$  given by  $f(x) = x^3 + 2$  is a bijection or not. Justify. (2)

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#### SECTION – A (4 x 1 = 4 marks)

1. In the following question, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Choose the correct answer out of the following choices. 1

- (a) Both A and R are true and R is correct explanation for A.
- (b) Both A and R are true but R is not correct explanation for A.
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**Assertion (A):** The Signum function  $f: R \rightarrow R$  given by  $f(x) = \begin{cases} 1, & \text{if } x > 0 \\ 0, & \text{if } x = 0 \\ -1, & \text{if } x < 0 \end{cases}$

is a bijection.

**Reason(R):** A function is said to be a bijection, if it is both one-one and onto.

2. If A is a skew symmetric matrix of order 3, then the value of  $5a_{12} + 6a_{22} - 5a_{21}$  is: 1

- (a) 1
- (b) 0
- (c)  $-10a_{12}$
- (d)  $-10a_{21}$

3. If  $[2 \quad 1 \quad 3] \begin{bmatrix} -1 & 0 & -1 \\ -1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix} = A$ , then the order of the matrix A is : 1

- (a)  $1 \times 3$
- (b)  $1 \times 1$
- (c)  $3 \times 3$
- (d)  $3 \times 1$

4. If  $A$  is a square matrix such that  $A^2 = A$ , then the value of  $(2 + A)^3 - 19A$  is: 1
- (a) 8 (b) 12 (c) 0 (d) -1

**SECTION – B (3 x 2 = 6 marks)**

5. Show that the relation  $R$  in the set  $A = \{1, 2, 3\}$  given by  $R = \{(1, 1), (2, 2), (3, 3), (1, 2), (2, 3)\}$  is reflexive but neither symmetric nor transitive. 2
6. If  $A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$ , find  $x$  and  $y$  so that  $A^2 - xI - yA = O$ , where  $I$  is identity matrix of order 2. 2
7. Construct a  $3 \times 3$  matrix given by  $a_{ij} = \begin{cases} 2i + 3j, & i < j \\ 5, & i = j \\ 3i - 2j, & i > j \end{cases}$  2

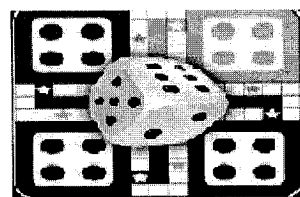
**SECTION – C (2 x 3 = 6 marks)**

8. Find the matrix  $X$  so that  $X \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} = \begin{bmatrix} -7 & -8 & -9 \\ 2 & 4 & 6 \end{bmatrix}$  3
9. Let  $R$  be a relation on the set  $\mathbb{R}$  of real numbers defined as  $\{(a, b) : 1 + ab > 0 \text{ for all } a, b \in \mathbb{R}\}$ . Show that  $R$  is reflexive and symmetric but not transitive. 3

**SECTION – D CASE STUDY QUESTION (4 marks)**

10. Priya, Surya and Chandrika are playing Ludo. While rolling the dice, they noted that the possible outcome of the throw every time belongs to the set  $\{1, 2, 3, 4, 5, 6\}$ . Let  $A$  denote the set of players and  $B$  be the set of all possible outcomes.

Then,  $A = \{P, S, C\}$ ,  $B = \{1, 2, 3, 4, 5, 6\}$



Based on the given information, answer the following questions:

- (i) How many one-one functions can be defined from  $A$  to  $B$ ? (1)
- (ii) If  $R_1 = \{(P, C), (S, S), (C, S)\}$  be a relation defined on  $A$ , then find the minimum ordered pairs which should be added in  $R_1$  to make it reflexive and symmetric. (1)
- (iii) Check if the relation  $R_2$  on the set  $B$  defined as  $R_2 = \{(x, y): y \text{ is divisible by } x\}$  is
- (a) symmetric (b) transitive (2)
- (OR)
- (iv) Check whether  $f: B \rightarrow B$  given by  $f(x) = x^3 + 2$  is a bijection or not. Justify. (2)







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#### SECTION – A (4 x 1 = 4 marks)

1. If a matrix  $A$  is both symmetric and skew-symmetric, then  $A$  is necessarily a 1  
 (a) diagonal matrix    (b) zero matrix    (c) identity matrix    (d) square matrix
2. If  $A$  is a skew symmetric matrix of order 3, then the value of  $6a_{12} - 8a_{22} - 6a_{21}$  is 1  
 (a) 1                      (b) 0                      (c)  $-12a_{21}$                       (d)  $-12a_{12}$
3. In the following question, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Choose the correct answer out of the following choices. 1  
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4. If  $A$  is a square matrix such that  $A^2 = A$ , then the value of  $7A - (I + A)^3$  is 1
- (a)  $A$                       (b)  $I$                       (c)  $O$                       (d)  $-I$

**SECTION – B (3 x 2 = 6 marks)**

5. Construct a  $3 \times 3$  matrix given by  $a_{ij} = \begin{cases} i - 3j, & i < j \\ -7, & i = j \\ 3i + 4j, & i > j \end{cases}$  2
6. Let  $R$  be a relation defined on the set of natural numbers  $N$  as: 2
- $R = \{(x, y): 2x + y = 11; x, y \in N\}$ . Is  $R$  transitive? Justify your answer.
7. Find matrix  $A$ , if  $2A + 3B = \begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix}$  and  $3A + 2B = \begin{bmatrix} -2 & 2 \\ 1 & -5 \end{bmatrix}$  2

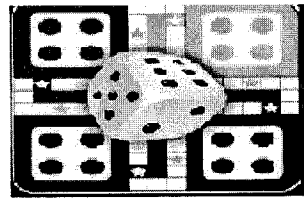
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