

CAMBRIDGE SCHOOL SRINIVASA PURI  
PERIODIC ASSESSMENT I - (2024-25-26)  
MATHEMATICS  
CLASS - XII  
SET B

TIME: 60 MINS

M.M. : 30

**General Instructions:**

1. The question paper consists of 17 questions. It contains five sections – section A, B, C, D and E. Each section is compulsory.
2. Section A has 10 MCQ's and 2 Assertion-Reason based questions of 1 mark each.
3. Section B has 1 Very Short Answer (VSA)-type question of 2 marks.
4. Section C has 1 Short Answer (SA)-type question of 3 marks.
5. Section D has 1 Long Answer (LA)-type question of 5 marks.
6. Section E has 2 source based/case based/passage based/integrated units of assessment (4 marks each) with sub parts.

**SECTION A**  
**Multiple Choice Questions**

1x12=12

1.

A function  $f: \mathbb{R} \rightarrow A$  defined as  $f(x) = x^2 + 1$  is onto, if  $A$  is

- (a)  $(-\infty, \infty)$  (b)  $(1, \infty)$   
(c)  $[1, \infty)$  (d)  $[-1, \infty)$

2.

If  $\begin{bmatrix} x & 1 \\ -1 & 0 \end{bmatrix} = O$ , then the value of  $x$  is

- (a) 0 (b) 1  
(c) -1 (d) 2

3.

If  $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ , then  $A^2 - 5A - 7I$  is

- (a) a zero matrix (b) an identity matrix  
(c) a diagonal matrix (d) None of these

4.

A function  $f: \mathbb{N} \rightarrow \mathbb{N}$  be defined by

$$f(n) = \begin{cases} \frac{n+1}{2}, & \text{when } n \text{ is odd} \\ \frac{n}{2}, & \text{when } n \text{ is even} \end{cases}, n \in \mathbb{N}$$

- (a) one-one but not onto (b) onto but not one-one  
(c) one-one and onto both (d) neither one-one nor onto

5.

If  $A = [a_{ij}]_{3 \times 3}$  and  $M_{ij}$  is the cofactor of element  $a_{ij}$ . Then, value of which of the following expression will be equal to  $\det(A)$ ?

- (a)  $a_{11}M_{11} + a_{12}M_{12} + a_{13}M_{13}$  (b)  $a_{21}M_{11} - a_{22}M_{12} + a_{23}M_{13}$   
(c)  $a_{21}M_{31} - a_{22}M_{32} + a_{23}M_{33}$  (d)  $-a_{21}M_{21} + a_{22}M_{22} - a_{23}M_{23}$

6.

Given a square matrix  $A$  of order  $3 \times 3$ , such that  $|A| = 12$ , then the value of  $|A \cdot \text{adj } A|$  is equal to

(a) 12

(b) 144

(c) 1728

(d) 72

7.

If  $A = \begin{bmatrix} 3 & -2 \\ 3 & -2 \end{bmatrix}$  is expressed as the sum of symmetric and skew symmetric matrix, then the skew symmetric matrix is

$$(a) \begin{bmatrix} 0 & -5 \\ 5 & 0 \end{bmatrix}$$

$$(b) \begin{bmatrix} 0 & 5/2 \\ -5/2 & 0 \end{bmatrix}$$

$$(c) \begin{bmatrix} 0 & -5/2 \\ 5/2 & 0 \end{bmatrix}$$

$$(d) \begin{bmatrix} 0 & 5 \\ -5 & 0 \end{bmatrix}$$

8.

The number of all scalar matrices of order 3, with entry  $-2, 2$  or  $-1$  is  $\left[ \right]_{\times}$

(a) 1

(b) 3

(c) 2

(d)  $3^3$ 

9.

Let  $A = \{1, 2, 3, 4\}$  and  $B = \{a, b, c\}$ . Then, number of one-one functions from  $A$  to  $B$  are

(a) 12

(b) 0

(c) 7

(d)  $7!$ 

10.

$A$  and  $B$  are invertible matrices of same order such that  $|(AB)^{-1}| = 8$ . If  $|A| = 2$ , then  $|B|$  is

(a) 16

(b)  $\frac{1}{16}$ (c)  $-16$ (d)  $-\frac{1}{16}$ 

### ASSERTION – REASON BASED QUESTIONS

In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

11.

**Assertion (A)** : For a matrix  $A = [a_{ij}]_{2 \times 3}$ , where  $a_{ij} = 3i - 5j$ ,  $a_{12} = -7$

**Reason (R)** :  $a_{12} = -1$  as  $i = 1, j = 2$

12.

**Assertion (A)** : A function  $f(x) = \cos x, x \in \left[0, \frac{3\pi}{2}\right]$  is bijective.

**Reason (R)** : For one-one function, each element in domain has unique image in the co-domain.

### SECTION B

#### Very Short Answer Type Question

2x1=2

13.

Show that the points  $(a+5, a-4)$ ,  $(a-2, a+3)$  and  $(a, a)$  do not lie on a straight line for any value of  $a$ .

### SECTION C

#### Short Answer Type Question

3x1=3

0.8  
8 70  
-64  
06

14. A relation  $R$  on set  $B = \{2, 4, 6, 8, 10\}$  is defined as  $R = \{(x, y) : |x^2 + y^2| > 5\}$ . Check whether the relation  $R$  is reflexive, symmetric and transitive. Justify your answer.

### SECTION D

#### Long Answer Type Question

15. Using matrices and determinants, solve the following system of equations:  
 $\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 2, \frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 5, \frac{6}{x} + \frac{9}{y} - \frac{20}{z} = -4$ , where  $x, y, z \neq 0$

### SECTION E

#### Case-Based Questions

16. **Case-Study I:**

Raj visited the amusement park with her family. The amusement park featured a huge swing that attracted many children. Raj noticed the swing traced the path of a parabola given by  $y = x^2$ .



$$\begin{array}{r} 720 \\ 1150 \\ \hline 870 \\ - 330 \\ \hline 540 \end{array}$$

$$\begin{array}{r} 36 \\ + 36 \\ \hline 72 \end{array}$$

Based on the above information, answer the following questions.

- (i) If  $f: R \rightarrow R$  defined by  $f(x) = x^2$ , then check surjectivity of  $f$ .  
 (ii) If  $f: N \rightarrow N$  defined by  $f(x) = x^2$ , then check injectivity of  $f$ .  
 (iii) a) If  $f: Z \rightarrow Z$  is defined by  $f(x) = x^2$ , then show that  $f$  is neither injective nor surjective.

OR

- b) If  $f: \{1, 2, 3, \dots\} \rightarrow \{1, 4, 9, \dots\}$  is defined by  $f(x) = x^2$ , then show that  $f$  is bijective.

- 17.

#### Case-Study II:

On her birthday, Seema decided to donate some money to children of an orphanage home. If there were 8 children less, everyone would have got Rs. 10 more. However, if there were 16 children more, everyone would have got Rs. 10 less. Let the number of children be  $x$  and the amount distributed by Seema for one child be  $y$  (in Rs.).



$$\begin{array}{l} 2^2 = 2^2 \\ 4 = 4 \end{array}$$

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information, answer the following questions:

Express the above information in the form of matrix equation

Hence, evaluate  $A (\text{adj } A)$ .