TIME: 60 MINS

M.M.: 30

#### General Instructions:

- The question paper consists of 17 questions. It contains five sections section
  A, B, C, D and E. Each section is compulsory.
- 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 mark:
- Section D has 1 Long Answer (LA)-type question of 5 marks
- 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



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

(b) (1, ∞)

(d) [-1, ∞)



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

(b) 1



(d) 2



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



A function  $f: N \to N$  be defined by

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

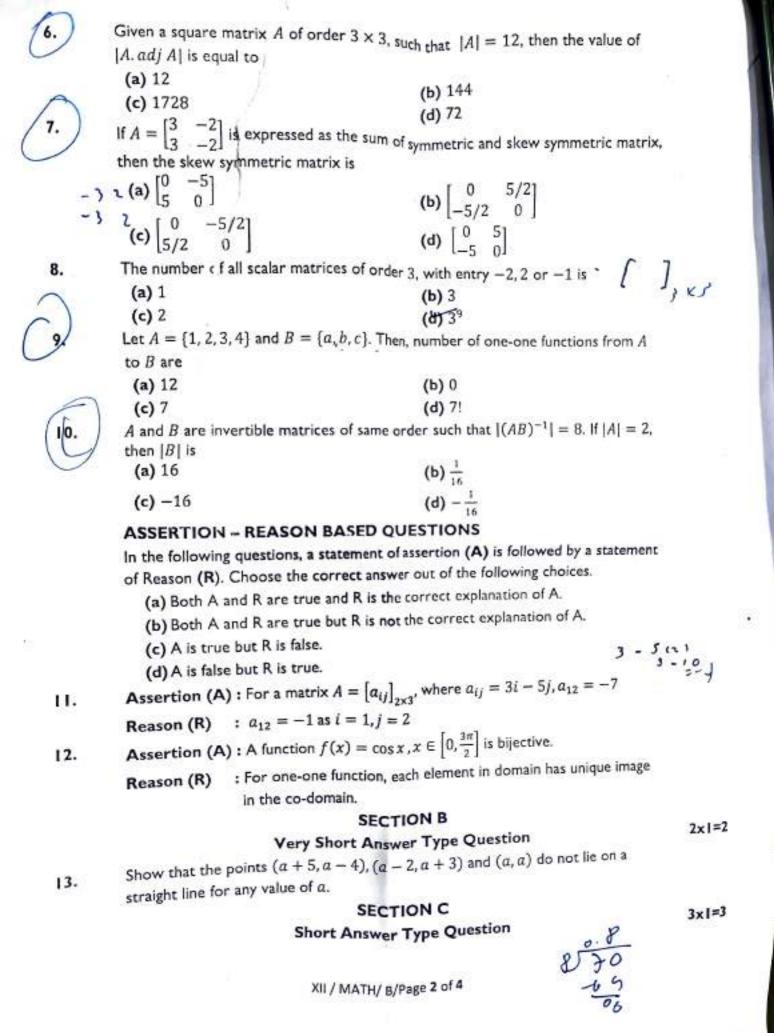
(a) one-one but not onto

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



If  $A = [a_{ij}]_{3\times3}$  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)  $-a_{21}M_{21} + a_{22}M_{22} a_{23}M_{23}$



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

### SECTION D

# Long Answer Type Question

5x1=

Using matrices and determinants, solve the following system of equations: 15.

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

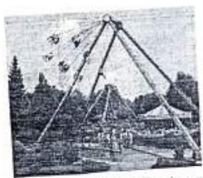
12,5,

### SECTION E

## Case-Based Questions

# 16.

Raj visited the amusement park with her family. The amusement park featured a Case-Study 1: huge swing that attracted many children. Raj noticed the swing traced the path of a parabola given by  $y = x^2$ .



ear, (buc)

Based on the above information, answer the following questions

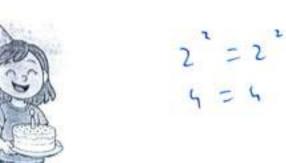
- If  $f: R \to R$  defined by  $f(x) = x^2$ , then check surjectivity of f. (i)
- If  $f: N \to N$  defined by  $f(x) = x^2$ , then check injectivity of f.
- a) If  $f: Z \to Z$  is defined by  $f(x) = x^2$ , then show that f is neither (ii) (iii) injective nor surjective.

#### OR

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

#### Case-Study II: 17.

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.).





mation, answer the following questions: the above information in the form of matrix equation

Hence, evaluate A (adj A).