



ANANDALAYA
PERIODIC TEST -1
Class : XII

Subject: Mathematics
Date : 19 – 07 – 2022

M.M: 40
Time: 2 Hours

General Instructions:

1. The question paper consists of 17 questions divided into 4 sections A, B, C and D.
2. All questions are compulsory.
3. Section A comprises of 5 questions of 1 mark each. Internal choice has been provided in one question.
4. Section B comprises of 4 questions of 2 marks each. Internal choice has been provided in one question.
5. Section C comprises of 5 questions of 3 marks each. An internal choice has been provided in one question.
6. Section D comprises of 3 questions of 4 marks each. An internal choice has been provided in one question.

SECTION- A

1 Given a skew – symmetric matrix $\begin{bmatrix} 0 & a & 1 \\ -1 & b & 1 \\ -1 & c & 0 \end{bmatrix}$, then the value of $(a + b - c)^2$ is _____. (1)

(A) 2 (B) 0 (C) 1 (D) 4

2 If A is a square matrix and $|A| = 5$ then find the value of $|AA^T|$ (1)

(A) 125 (B) 5 (C) 25 (D) $\frac{1}{25}$

3 a) In the interval $\frac{\pi}{2} < x < \pi$, find the value of x for which the matrix $\begin{bmatrix} 2\sin x & 3 \\ 1 & 2\sin x \end{bmatrix}$ is singular. (1)

OR

b) Given a square matrix A of order 3×3 , such that $|A| = 12$, find the value of $|A \cdot adj A|$

4 Find whether the relation R in the set $A = \{5, 6, 7\}$ given by $R = \{(5, 5), (5, 6), (6, 5)\}$ is transitive. (1)
Justify.

5 If $A^T = [-1 \ 2 \ 3]$ and $B = [-2 \ -1 \ 4]$, find AB (1)

SECTION- B

6 Let N be the set of natural numbers and relation R on N be defined by (2)

$R = \{(x, y) : x, y \in N, x + 4y = 10\}$. Determine whether the relation R is reflexive, symmetric.

7 a) If $A = \begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is such that $A^2 = I$, then show that $1 - \alpha^2 - \beta\gamma = 0$. (2)

OR

b) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$, prove that $A - A^T$ is a skew symmetric matrix, where A^T denotes the transpose of A.

- 8 Find a, b, c and d if $\begin{bmatrix} 3a + 4b & 2 \\ c + d & 2c - d \\ a - 2b & 1 \end{bmatrix} = \begin{bmatrix} 2 & 2 \\ 5 & -5 \\ 4 & 1 \end{bmatrix}$ (2)
- 9 Area of a triangle with vertices $(k, 0), (1, 1)$ and $(0, 3)$ is 5 sq units. Find the value(s) of k . (2)

SECTION- C

- 10 A function $f: N \rightarrow N$ defined as $f(x) = 5x^2 + 3$. Show that $f(x)$ is one- one but not onto. (3)
- OR**
- Let $R = \{(3,3), (6,6), (9,9), (12,12), (6,12), (3,9), (3,6)\}$ be a relation on the set $A = \{3, 6, 9, 12\}$
Check whether relation R is reflexive, symmetric or transitive?

- 11 If $A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then find k so that $A^2 = 8A + kI$ (3)
- 12 If A and B are two square matrices of order 2 such that $2A + 3B = I_2$ and $A + B = 2A^T$. Show that $A = \frac{1}{5}I_2$. (3)
- 13 If $A = \begin{bmatrix} 5 & -2 \\ 3 & -2 \end{bmatrix}$, verify that $(adj A \cdot A) = |A|I_2$. (3)
- 14 Let A_{ij} denote the co-factors. Write the co-factors of the elements of the 1st column of the determinant $\begin{vmatrix} 1 & 1 & -2 \\ 2 & 3 & -5 \\ 4 & -1 & -3 \end{vmatrix}$. Also, Evaluate $a_{11}A_{11} + a_{21}A_{21} + a_{31}A_{31}$ (3)

SECTION-D

- 15 Show that the relation R in the set Z of integers given by $R = \{(a, b): 2 \text{ divides } a - b\}$ is an equivalence relation. (4)
- 16 a) Express the matrix $\begin{bmatrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix. (4)
- OR**
- b) If $A = \begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}$, $B = [-2 \quad -1 \quad 4]$ verify that $(AB)^T = B^T A^T$
- 17 Using matrix method, solve the following system of equations: (4)
- $$x + 2y - 3z = 6 \quad ; \quad 3x + 2y - 2z = 3; \quad 2x - y + z = 2$$