विद्या सर्वार्थि साधिका

ANANDALAYA
PERIODIC TEST -1
Class : XII

Subject: Mathematics (041) M.M: 40
Date : 17 – 07–2023 Time: $1\frac{1}{2}$ Hours

General Instructions:
1. The question paper consists of 22 questions divided into 3 sections A, B and C
2. All questions are compulsory.
3. Section A comprises of 10 questions of 1mark each.
4. Section B comprises of 6 questions of 2 marks each. Internal choice has been provided in two questions.
5. Section C comprises of 6 questions of 3 marks each. Internal choice has been provided in two questions.

SECTION- A

1 Given set $A = \{5, 6, 7\}$ and a relation $R = \{(5, 5), (6, 7), (7, 5)\}$, which ordered pair(s) should be added, so that relation R is reflexive? (1)
(A) (6, 6) (B) $(7, 7)$ (C) $(5, 5)$,(6, 6) (D) (6, 6) , $(7, 7)$

2 Let $f: R \to R$ be defined as $f(x) = [x]$, where $[x]$ denotes the greatest integer, is (1)
(A) f is one - one and onto (B) f is many one and onto
(C) f is one -one but not onto (D) f is neither one -one nor onto

3 Evaluate: $\sin^{-1}\left[\cos\left(\sin^{-1}\frac{\sqrt{3}}{2}\right)\right]$ (1)
(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{3}$

4 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)
(A) $\frac{\pi}{2}$ (B) $\frac{5\pi}{6}$ (C) $\frac{2\pi}{3}$ (D) $\frac{3\pi}{2}$

5 The adjoint of the matrix $\begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix}$ is _____. (1)
(A) $\begin{bmatrix} 3 & 1 \\ 4 & 2 \end{bmatrix}$ (B) $\begin{bmatrix} -3 & 1 \\ -4 & -2 \end{bmatrix}$ (C) $\begin{bmatrix} 2 & 1 \\ -4 & 3 \end{bmatrix}$ (D) $\begin{bmatrix} 3 & 1 \\ -4 & 2 \end{bmatrix}$

6 If $A = \begin{bmatrix} 1 & -2 & 3 \\ -4 & 2 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 2 & 1 \end{bmatrix}$, then____ (1)
(A) $AB = BA$ (B) AB is of order 2×2
(C) BA is of order 2×2 (D) AB does not exist.

7. Given set $A = \{a, b, c\}$. An identity relation in set A is_____
(A) $R = \{(a, b), (a, c)\}$ (B) $R = \{(a, a), (b, b), (c, c)\}$
(C) $R = \{(a, a), (b, b), (c, c), (a, c)\}$ (D) $R = \{(c, a), (b, a), (a, a)\}$

8 Given a square matrix A of order 3×3 , such that $|A| = 12$, find the value of $|A.adjA|$. (1)
(A) 144 (B) 12 (C) 1 (D) 1728

9 The relation R on the set $A = \{0,1,2,3\}$ given by $R = \{(0, 0), (0, 1), (0, 3), (1, 0), (1, 1), (2,2), (3,0)(3,3)\}$ is _____ (1)
(A) reflexive but not transitive (B) reflexive and transitive
(C) reflexive, symmetric and transitive (D) symmetric and transitive

10 Evaluate $\cos\left\{\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right) + \frac{\pi}{6}\right\}$ (1)
(A) $\frac{1}{2}$ (B) 1 (C) 2 (D) -1

SECTION- B

11 If $A = \{1, 2, 3\}$ and relation $R = \{(2, 3)\}$ in A. Check whether relation R is reflexive, symmetric and transitive. Justify. (2)

12 A function $f: N \to N$ defined as $f(x) = 5x^2 + 3$. Show that $f(x)$ is one- one but not onto. (2)

13 a) If the matrix A = $\begin{bmatrix} a & b \\ c & -a \end{bmatrix}$, is the square root of the 2×2 identity matrix, then find the relation between $a, b \text{ and } c$. (2)

OR

b) Construct a 3×2 matrix A, if A = $[a_{ij}]$, where

$$a_{ij} = \begin{cases} i + j, & if\ i \geq j \\ i - j, & if\ i < j \end{cases}$$

14 a) If the matrix $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$ and $A^2 = kA$, then find the value of k. (2)

OR

b) Find non-zero values of *x* satisfying the matrix equation $x\begin{bmatrix} 2x & 2 \\ 3 & x \end{bmatrix} + 2\begin{bmatrix} 8 & 5x \\ 4 & 4x \end{bmatrix} =$

$2\begin{bmatrix} x^2 + 8 & 24 \\ 10 & 6x \end{bmatrix}$

15 If the co-ordinates of the vertices of an equilateral triangle with sides of length p are (x_1, y_1), (x_2, y_2), (x_3, y_3) then show that $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}^2 = \frac{3}{4}p^2$ (2)

16 If $A_\alpha = \begin{bmatrix} cos\alpha & sin\alpha \\ -sin\alpha & cos\alpha \end{bmatrix}, then$ show that $A_\alpha . A_\beta = A_{\alpha+\beta}$. (2)

SECTION- C

17 If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, Evaluate $A^2 - 4A - 5I$. (3)

18 Let *Z* be the set of all integers and *R* be the relation on *Z* defined as $R = \{(a, b)\ ;\ a, b \in Z$, and $(a - b)\ is\ divisible\ by\ 5.\}$ Prove that *R* is an equivalence relation. (3)

19 a) Let A= $\begin{bmatrix} 3 & 2 & 5 \\ 4 & 1 & 3 \\ 0 & 6 & 7 \end{bmatrix}$, express A as a sum of two matrices such that one is symmetric and the other is skew symmetric. (3)

OR

b) If $A \text{ and } B$ are symmetric matrices, show that $AB + BA$ is symmetric and $AB - BA$ is skew symmetric.

20 a) Let N be the set of all natural numbers and R be a relation on $N \times N$ defined by $(a, b)R(c, d) \Leftrightarrow ad = bc$ for all$(a, b), (c, d) \in N \times N$. Show that R is equivalence relation. (3)

OR

b) Show that the function $f: R \longrightarrow R$ defined by $(x) = \frac{x}{x^2+1}$, for all $x \in R$, is neither one- one nor onto.

21 If $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$, verify $A.adjA = |A|I_3$ (3)

22 Using matrix method, solve the following system of equations: (3)

$$x - y + 2z = 7 \ ; \quad 3x + 4y - 5z = -5; \quad 2x - y + 3z = 12$$