Bhartiyam International School

Pre – Mid Term Assessment (2022-23)
Subject: Mathematics
Class: XII

Date: 15/07/2022 **M.M: 40**
Name: _____ Roll No: _____ Duration: 90 mins

General Instructions:

1. This question paper contains **four sections– A, B, C, and D**. Each part is compulsory.
2. **Section - A** has 6 **very short answer type (VSA) questions** of 1 marks each.
3. **Section - B** has 5 **short answer type (SA1) questions** of 2 marks each.
4. **Section - C** has 3 **short answer type (SA2) questions** of 3 marks each
5. **Section - D** has 3 **long answer type questions (LA)** of 5 marks each.

Section – A

1. If A is a matrix of order m × n and B is a matrix such that AB^T and B^TA are both defined, then find the order of matrix B. 1

2. Evaluate: $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right) + \cos^{-1}\left(-\frac{1}{2}\right) + \sin^{-1}\left(-\frac{1}{2}\right)$. 1

3. Find the domain of function $y = \sin^{-1}(4x)$. 1

4. Evaluate: Write the principal value of $\tan^{-1}(1) + 2\sec^{-1}(2) + \sin^{-1}\left(-\frac{1}{2}\right)$. 1

5. Find the value of $\cos^{-1}\left[\cos\left(\frac{-13\pi}{6}\right)\right]$. 1

6. How many reflexive relations in A x A can be formed for a set A if n(A)=3? 1

Section – B

7. Let R be the relation in the set of integers Z given by R = {(a, b): 2 divides a – b}. Show that R is equivalence. 2

8. If matrix $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$ and $A^2 = kA$, then write the value of k. 2

9. A and B are symmetric matrices of the same order. What type of matrix is $(AB^T - BA^T)$? 2

10. What are the maximum number of equivalence relations on the set A = {1,2,3}. 2

11. Find the domain of function $y = sec^{-1}(2x - 1)$. 2

Section – C

12. Find the value of x if $\begin{bmatrix}1 & 2 & 1\end{bmatrix}\begin{bmatrix}1 & 2 & 0\\ 2 & 0 & 1\\ 1 & 0 & 2\end{bmatrix}\begin{bmatrix}0\\ 2\\ x\end{bmatrix} = O$. 3

13. Let $f : N \to R$ be a function define as $f(x) = 4x^2 + 12x + 15$. Show that $f : N \to S$, where S is the range of f, is bijective. 3

14. The bookshop of school A and B has 10 dozen chemistry books, 8 dozen physics books , 10 dozen mathematics books and 8 dozen chemistry books, 10 dozen physics books, 12 dozen mathematics books respectively. Their selling prices are ₹ 80, ₹ 60 and ₹ 40 each respectively. Find the total amount the bookshop will receive from selling all the books using matrix algebra. 3

Section – D

15. Express the matrix $B = \begin{bmatrix}2 & -2 & -4\\ -1 & 3 & 4\\ 1 & -2 & -3\end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix. 5

16. Let A = {1, 2, 3, ...,9} and R be the relation in A× A defined by (a , b) R (c , d) if a + d = b + c for (a , b), (c , d) in A × A. Prove that R is an equivalence relation. 5

17. Find a matrix X such that $X\begin{bmatrix}1 & 2 & 3\\ 4 & 5 & 6\end{bmatrix} = \begin{bmatrix}-7 & -8 & -9\\ 2 & 4 & 6\end{bmatrix}$ 5