PERIODIC TEST 1 (APRIL, 2023)

GRADE- XII

SUBJECT - MATHEMATICS

TIME: 90 MINS   **MM- 40**

GENERAL INSTRUCTION

- **This question paper consists of 20 questions.**
- **All questions are compulsory. However internal choice is provided in some questions. A student is expected to attempt only one of these questions.**
- **Section A consists of 10 questions carrying 1 mark each**
- **Section B consist of 5 questions carrying 2 marks each.**
- **Section C consists of 2 questions carrying 3 marks each.**
- **Section D contains 1 question of case study consist of 4 marks**
- **Section E consists of 2 question carrying 5 marks each.**

SECTION-A $(10 \times 1 = 10)$

Q1. Determine whether each of the following relations are reflexive, symmetric and transitive:

R: { (x , y) : x is father of y }

Q2. Find the principal values of the following: $\sin^{-1}\left(\frac{-1}{2}\right)$

Q3. Find the value of; $\cos^{-1}\left(\frac{\cos 7\pi}{6}\right)$

Q4. What is the value of $\tan^{-1} x + \tan^{-1} y$

Q5. What is the number of all possible matrices of order 3×3 with each entry 0 or 1 is

Q6. Find the values of x, y, z from the following equation:

$$\begin{bmatrix} 4 & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} y & z \\ 1 & 5 \end{bmatrix}$$

Q7. Let A=$\begin{bmatrix} 2 & 4 \\ 3 & 2 \end{bmatrix}$ B =$\begin{bmatrix} 1 & 3 \\ -2 & 5 \end{bmatrix}$

Find the following:

A + B

Q8. Find the transpose of the following matrices:

$$\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix},$$

Q9. What is the range of $\sin^{-1} x$.

Q10. In the matrix A=$\begin{bmatrix} 3 & -1 & 0 \\ 2 & 4 & 1 \\ 4 & 3 & -1 \end{bmatrix}$ What is

(i) The order of the matrix   (ii) The number of elements.

SECTION- B   (2×5=10)

Q11 Determine whether each of the following relations are reflexive, symmetric and transitive:

$$"R = \{(x, y : 3x - y = 0\}$$

Q12. Find the values of the following:

$$\tan^{-1} 1 + \cos^{-1} \frac{-1}{2} + \sin^{-1} \frac{-1}{2}$$

Q13. Let A = {1, 2, 3}, B = {4, 5, 6, 7} and let f = {(1, 4), (2, 5), (3, 6)} be a function from A to B. Show that f is one- one.

Q14. Find the value of x, y, z from the following equations:

$$\begin{bmatrix} x + y & 2 \\ 5 + z & xy \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix}$$

Q15. If A = $\begin{bmatrix} -1 & 2 & 3 \\ 5 & 7 & 9 \\ -2 & 1 & 1 \end{bmatrix}$ And B = $\begin{bmatrix} -4 & 1 & -5 \\ 1 & 2 & 0 \\ 1 & 3 & 1 \end{bmatrix}$, Then verify that

$$(A+B)' = A' + B'$$

SECTION - C   (3×2=6)

Q16. If $\tan^{-1}\frac{x-1}{x-2} + \tan^{-1}\frac{x+1}{x-2} = \frac{\pi}{4}$, Then find the value of x.

Q17. If A = $\begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$ And I = $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, Find k so that $A^2 = kA - 2I$

OR

Q17. Using elementary transformations, find the inverse of each of the matrices, if it exists

(i) $\begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$

SECTION – D (CASE STUDY QUESTION)   (4×1=4)

Q18. In a city there are two factories A and B. Each factory produces sports clothes for boys and girls . There are 3 types of clothes produced in both factories, type I, II, III. For boys the number of units of type I, II , III are 80, 70, 65 in factory A and 85, 65, and 72 in factory B. For girls the number of units of type I, II, III respectively are 80, 75, 90 in a factory A and 50, 55, 80 in factory B.

Based on above information, answer the following question.

(i) If P represent the matrix of number of units of each type produced by the factory A for both boys and girls, then P is given by

(a) $\begin{bmatrix} 85 & 50 \\ 65 & 55 \\ 72 & 80 \end{bmatrix}$ (b) $\begin{bmatrix} 50 & 55 & 80 \\ 65 & 65 & 72 \end{bmatrix}$

(c) $\begin{bmatrix} 80 & 75 & 90 \\ 80 & 70 & 65 \end{bmatrix}$ (d) $\begin{bmatrix} 80 & 80 \\ 70 & 75 \\ 65 & 90 \end{bmatrix}$

(ii) If Q represent the matrix of number of units of each type produced by the factory B for both boys and girls, then Q is given by

(a) $\begin{bmatrix} 85 & 50 \\ 65 & 55 \\ 72 & 80 \end{bmatrix}$ (b) $\begin{bmatrix} 50 & 55 & 80 \\ 85 & 65 & 72 \end{bmatrix}$

(c) $\begin{bmatrix} 80 & 75 & 90 \\ 80 & 70 & 65 \end{bmatrix}$ (d) $\begin{bmatrix} 80 & 80 \\ 70 & 75 \\ 65 & 90 \end{bmatrix}$

(iii) The total production of sports clothes of each type for boys is given by the matrix

(a) [165   130   137]   (b) [130   165   137]

(c) [165   135   137]   (d) [137   135   167]

(iv) The total produced of sports clothes of each type for girls is given by the matrix

(a) [130   130   170]   *(b)* [130   165   137]

(c)   [130   170   130]   (d) None of these

SECTION- E   (5×2=10)

Q19. Find the value of each of the following:

$$\tan\frac{1}{2}\left[\sin^{-1}\frac{2x}{1+x^2}+\cos^{-1}\frac{1-y^2}{1+y^2}\right]$$

(i) $3\sin^{-1}x = \sin^{-1}(3x - 4x^3)$

Q20. Show that the Signum Function f: R→ R, is given by

F (x)= $\begin{cases} 1, & \textbf{if } x > 0 \\ 0, & if\ x = 0 \\ 1, & if\ x < 0 \end{cases}$

Is neither one-one nor onto.