

Bhavan's Tripura Vidyamandir1st Quarterly Test : (2025-2026)**Class:- 12**

Time:- 2 hours

Name of the student :

Subject: Mathematics

Total :- 50 Marks

Roll: Sec:

GENERAL INSTRUCTIONS

1. This question paper contain 5 sections A B C D and E
2. Section A contain 10 MCQ each carries 1 mark.
3. Section B contain 5 question each carries 2 marks.
4. Section C contain 4 question each carries 3 marks.
5. Section D contain 2 question each carries 5 marks.
6. Section E contain 2 case based question each carries 4 marks having sub parts (1+1+2)
7. "Use of Calculator is not permitted".
8. "All answers should be in proper mathematical language".

SECTION:- A**1 X 10 = 10**

1. If $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$, then
(i) $|\vec{a}| = |\vec{b}|$ (ii) $\vec{a} \parallel \vec{b}$ (iii) $\vec{a} \perp \vec{b}$ (iv) none of these
2. The principal value of $\sin^{-1}\left(\frac{-1}{2}\right)$ is
(i) $\frac{\pi}{6}$ (ii) $\frac{\pi}{3}$ (iii) $-\frac{\pi}{6}$ (iv) None of these
3. $\cos^{-1} \cos\left(\frac{7\pi}{6}\right)$ is equal to
(i) $\frac{7\pi}{6}$ (ii) $\frac{5\pi}{6}$ (iii) $\frac{\pi}{3}$ (iv) NONE of these
4. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined as $f(x)=3x$ then choose the correct answer
(i) f is one one onto (ii) f is many one onto
(iii) f is one one but not onto (iv) f is neither one one nor onto
5. Let R be the relation in the set $\{1,2,3,4\}$ given by $R=\{(1,2), (2,2), (1,1), (4,4), (1,3), (3,3), (3,1)\}$
Choose the correct answer
(i) R is reflexive and symmetric but not transitive
(ii) R is reflexive and transitive but not symmetric
(iii) R is symmetric and transitive but not reflexive
(iv) none of these
6. $A = \begin{bmatrix} 2 & 5 \\ 4 & x \end{bmatrix}$, A is singular matrix, then the value of x is
(i) 2 (ii) 0 (iii) 10 (iv) -10
7. If $\begin{bmatrix} x+y & 3 \\ 5 & y \end{bmatrix} = \begin{bmatrix} 10 & 3 \\ 5 & 6 \end{bmatrix}$, then the value of x is -
(i) 10 (ii) 5 (iii) 4 (iv) -4
8. If A is a square matrix such that $A^2 = A$, then $(I + A)^3 - 7A$ is equal to
(i) A (ii) $I-A$ (iii) I (iv) $3A$
9. The value of the $\begin{vmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{vmatrix}$ is
(i) 0 (ii) 1 (iii) $\cos^2 \alpha$ (iv) $2\sin^2 \alpha$
10. The value of k for which $f(x)=\begin{cases} 3x-8, & \text{if } x \leq 5 \\ 2k, & \text{if } x > 5 \end{cases}$ is continuous
(i) $2/7$ (ii) $7/2$ (iii) $3/7$ (iv) $4/7$

SECTION:- B**2 X 5 = 10**

11. Prove that $\cos^{-1} \frac{4}{5} + \cos^{-1} \frac{12}{13} = \cos^{-1} \left(\frac{33}{65}\right)$

12. If $A = \begin{bmatrix} 1 & 2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$, find AB (if exist).

13. Find the value of k for which the function f defined as

$$f(x) = \begin{cases} \frac{1 - \cos kx}{x \sin x}, & x \neq 0 \\ \frac{1}{2}, & x = 0 \end{cases} \text{ is continuous at } x=0.$$

14. $A = \begin{bmatrix} 2 & 3 & 5 \\ 6 & x & y \\ 7 & 8 & 0 \end{bmatrix}$, find the minor of x and co factor of y .

15. Let $R = \{(x, y) : x + 2y = 8\}$ be a relation on N find the range and dom R .

SECTION:- C

3 X 4 = 12

16. Evaluate $\begin{vmatrix} a + ib & c + id \\ -c + id & a - ib \end{vmatrix}$

17. Prove that $\cot^{-1} \frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}} = \frac{x}{2}$

18. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ show that $A^2 - 5A + 7I = 0$, hence find A^{-1}

19. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three unit vectors such that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ then find the value of $(\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a})$

SECTION : D

5 X 2 = 10

20. Show that the function $f: N \rightarrow N$, defined by

$$f(x) = \begin{cases} x + 1, & \text{if } x \text{ is odd} \\ x - 1, & \text{if } x \text{ is even} \end{cases} \text{ is one-one and onto.}$$

(3+2)

21. Express A matrix as the sum of symmetric matrix and skew symmetric matrix $A = \begin{bmatrix} 2 & -2 \\ 6 & 3 \end{bmatrix}$

SECTION: E (CASE BASED QUESTION)

4X2=08

22. CASE: 1

(1+1+2)

Teams A, B, C went for playing a tug of war game. Teams A, B, C have attached a rope to a metal ring and is trying to pull the ring into their own area.

Team A pulls with force $F_1 = 6\hat{i} + 0\hat{j} \text{ kN}$

Team B pulls with force $F_2 = -4\hat{i} + 4\hat{j} \text{ kN}$

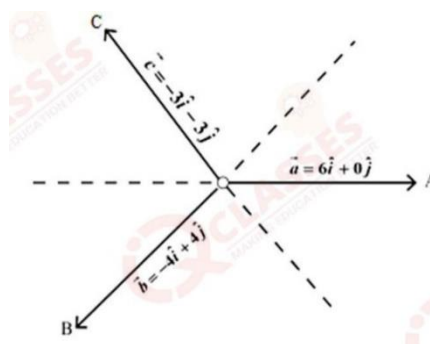
Team C pulls with force $F_3 = -3\hat{i} - 3\hat{j} \text{ kN}$

i) What is the magnitude of the force of Team A?

(ii) Which team will win the game?

(iii) Find the magnitude of the resultant force exerted by the teams.

OR In which direction is the ring getting pulled?



23. CASE: 2

Students of a school are taken to a railway museum to learn about railways heritage and its history.

(1+1+2)



An exhibit in the museum depicted many rail lines on the track near the railway station. Let L be the set of all rail lines on the railway track and R be the relation on L defined by $R = \{(l_1 : l_2) \mid l_1 \text{ is parallel to } l_2\}$ on the basis of the above information, answer the following questions:

- (i) Find whether the relation R is symmetric or not.
- (ii) Find whether the relation R is transitive or not.
- (iii) If one of the rail lines on the railway track is represented by the equation $y = 3x + 2$ then find the set of all rail lines in R related to it.

OR

Let S be the relation defined by $S = \{(l_1 : l_2) \mid l_1 \text{ is perpendicular to } l_2\}$ check whether the relation S is transitive.