



INDIAN SCHOOL AL WADI AL KABIR

Unit Test Model Paper (2024-2025)

Class: XII

Sub: MATHEMATICS (041)

Max Marks: 30

Date: 20.05.2024

Time: 1 hr.

General Instructions:

1. This question paper is divided into 4 sections- A, B, C and D.
2. Section A comprises of 7 questions of 1 mark each.
3. Section B comprises of 3 questions of 2 marks each.
4. Section C comprises of 3 questions of 3 marks each.
5. Section D comprises of 2 case study-based question.
6. Internal choice has been provided.

SECTION A

| | | | | | | | | | |
|-------------|--|-----------------------------|---|------------------------------|---|--------------------------|---|-----------------------------------|--|
| Q.1. | If $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 3 \\ 2 \end{bmatrix}$, then the value of $(2x + y - z)$ is : | | | | | | | 1 | |
| | A | 1 | B | 2 | C | 3 | D | 5 | |
| Q2. | Let R be the relation in the set N given by $R = \{(a, b) : a = b - 2, b > 6\}$, then | | | | | | | 1 | |
| | A | $(2,4) \in R$ | B | $(3,8) \in R$ | C | $(6,8) \in R$ | D | $(8,7) \in R$ | |
| Q3. | The value of $\tan^{-1} \sqrt{3} + \cot^{-1} \left(-\frac{1}{\sqrt{3}} \right)$ is equal to | | | | | | | 1 | |
| | A | π | B | $-\frac{\pi}{3}$ | C | $-\pi$ | D | $\frac{\pi}{6}$ | |
| Q4. | $\sin \left\{ 2 \cos^{-1} \left(-\frac{3}{5} \right) \right\}$ is equal to | | | | | | | 1 | |
| | A | 6/25 | B | 24/25 | C | 4/5 | D | -24/25 | |
| Q5. | If a matrix A is both symmetric and skew-symmetric, then | | | | | | | 1 | |
| | A | A is a diagonal matrix | B | A is a zero matrix | C | A is a scalar matrix | D | A is a square matrix | |
| Q6. | Let $A = \{1, 2, 3\}$ and consider the relation $R = \{(1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1, 3)\}$. Then R is | | | | | | | 1 | |
| | A | reflexive but not symmetric | B | reflexive but not transitive | C | symmetric and transitive | D | neither symmetric, nor transitive | |

| | | |
|------|---|---|
| Q7 | <p>In the following question a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.</p> <p>A) Both A and R are true and R is the correct explanation of A. B) Both A and R are true but R is not the correct explanation of A. C) A is true but R is false. D) A is false but R is true.</p> | 1 |
| | <p>Assertion (A): If A and B are symmetric matrices then $AB - BA$ is a skew symmetric matrix.</p> <p>Reason (R): For a skew symmetric matrix $A = [a_{ij}]$, $a_{ij} = 0$ if $i = j$.</p> | |
| | SECTION B | |
| Q8. | <p>Compute the indicated product: $\begin{bmatrix} 3 & 2 \\ 1 & 4 \\ 5 & 3 \end{bmatrix} \begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix}$</p> | 2 |
| Q9. | <p>$A = [a_{ij}]$ where A is 2X2 matrix and $a_{ij} = \frac{i^2+2j}{2}$, then write all elements of A. Or Sketch the graph of $f(x) = \cos^{-1}x$, f: [-1, 1] to $[0, \pi]$</p> | 2 |
| Q10. | <p>Prove that the relation R on the set $N \times N$ defined by $(a, b) R (c, d)$, if $ad = bc$, for all $(a, b), (c, d) \in N \times N$ is an equivalence relation.</p> | 2 |
| | SECTION C | |
| Q11. | <p>If $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$ then prove $A^2 - 3A - 7I = 0$</p> | 3 |
| Q12. | <p>If $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ find A^{-1} OR</p> <p>Solve using matrices: $2x + y + z = 13$; $2x - y = 10$; $x - y + z = 8$.</p> | 3 |
| Q13. | <p>Show that the function $f(x) = \frac{x-2}{x-3}$, $f: R - \{3\}$ to $R - \{1\}$ is both one to one and onto.</p> | 3 |

SECTION D Case study-based questions

Q14 A manufacturer produces three stationery products Pencil, Eraser and Sharpener which he sells in two markets. Annual sales are indicated below

| Market | Products (in numbers) | | |
|--------|-----------------------|--------|-----------|
| | Pencil | Eraser | Sharpener |
| A | 10,000 | 2,000 | 18,000 |
| B | 6,000 | 20,000 | 8,000 |



If the unit Sale price of Pencil, Eraser and Sharpener are ₹ 2.50, ₹1.50 and ₹ 1.00 respectively, and unit cost of the above three commodities are ₹ 2.00, ₹ 1.00 and ₹ 0.50 respectively, then,

- (i) Find the total revenue of market A.
- (ii) Find the total revenue of market B
- (iii) a) What is the cost incurred in market A
Or
b) Find the total profit earned in market A and B.

1
1
2

Q15 Hari visited an exhibition along with his family. The exhibition had a huge swing. Hari found that the swing traced the path of a Parabola as given by $f(x) = x^2 + 1$

Answer the following questions based on the above informations



- i) What is the range of $f(x) = x^2 + 1$
- ii) If $f(x) = x^2 + 1$, if $x \geq 0$, then find the preimage of 9.
- iii) a) Show that $f(x) = \cos x$, $f: \mathbb{R}$ to \mathbb{R} is neither one to one nor onto
OR
b) Determine whether $h(x) = x^2 + 2x + 2$, $f: [0, \infty)$ to $[0, \infty)$ is onto. If not modify the codomain so that $h(x)$ becomes an onto function.

1
1
2

ANSWER

| | | | | | |
|-----|--|-----|--|-----|---|
| Q1 | D | Q2 | C | Q3 | A |
| Q4 | D | Q5 | B | Q6 | A |
| Q7 | B | Q8 | $\begin{bmatrix} 11 & 2 \\ 7 & 14 \\ 18 & 2 \end{bmatrix}$ | Q9 | $\begin{bmatrix} 3 & 5 \\ 2 & 2 \\ 3 & 4 \end{bmatrix}$ |
| Q12 | $= \begin{bmatrix} 7 & -3 & -3 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}$ <p style="text-align: right;">OR</p> $x = 5, y = 0, z = 3$ | Q14 | ₹46000 ₹53000 ₹31000 OR ₹32000 | Q15 | i) $[1, \infty)$ ii) $2\sqrt{2}$ iii)b. $[2, , \infty)$ |
