B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL

PERIODIC TEST-1 2025-26
APPLIED MATHEMATICS
MARKING SCHEME

Class: XII B **Time: 1hr**
Date: 03.07.25 **Max Marks: 25**
Admission no: **Roll no:**

General Instructions:

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1. This Question Paper has 4 Sections A, B, C and D.
2. Section A has 5 MCQs carrying 1 mark each
3. Section B has 2 questions carrying 02 marks each.
4. Section C has 2 questions carrying 03 marks each.
5. Section D has 2 questions carrying 05 marks each.
6. All Questions are compulsory.

SECTION A

1. If for matrix A, $A^3 = I$, then A^{-1} = 1m
(a) A **(b) A^2** (c) A^3 (d) None of these

2. If A, B are two non-singular matrices of same order, then 1m
(a) AB is non singular (b) AB is singular (c) $(AB)^{-1} = B^{-1}A^{-1}$ (d) None of these

3. For what value of K inverse does not exist for the matrix $\begin{bmatrix} 1 & 2 \\ k & 6 \end{bmatrix}$? 1m
(a) 0 **(b) 3** (c) 6 (d) None of these

4. If A and B are square matrices of same order, then AB' – BA' is a 1m
(a) skew-symmetric matrix (b) symmetric matrix (c) null matrix (d) None of these

5. If A is any m x n matrix and B is a matrix such that AB and BA are both defined, then B is matrix of order 1m
(a) n x m (b) m x m (c) m x n (d) None of these

SECTION B

6. If A = $\begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$, show that $A^2 - 5A - 14I = 0$ 2m

A:- **Step by Step Solution:**

Step 1

Compute $A^2 = A \cdot A$.

Step 2

Multiply matrix A by itself:

$$A^2 = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix} \cdot \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$$

Step 3 1m

Perform the matrix multiplication:

$$A^2 = \begin{bmatrix} (3 \cdot 3 + (-5) \cdot (-4)) & (3 \cdot (-5) + (-5) \cdot 2) \\ (-4 \cdot 3 + 2 \cdot (-4)) & (-4 \cdot (-5) + 2 \cdot 2) \end{bmatrix} = \begin{bmatrix} 31 & -25 \\ -20 & 24 \end{bmatrix}$$

Step 4

Compute $5A$ and $14I$:

$$5A = 5 \cdot \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix} = \begin{bmatrix} 15 & -25 \\ -20 & 10 \end{bmatrix}$$

$$14I = 14 \cdot \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 14 & 0 \\ 0 & 14 \end{bmatrix}$$ 1m

Step 5

Combine the results and verify:

$$A^2 - 5A - 14I = \begin{bmatrix} 31 & -25 \\ -20 & 24 \end{bmatrix} - \begin{bmatrix} 15 & -25 \\ -20 & 10 \end{bmatrix} - \begin{bmatrix} 14 & 0 \\ 0 & 14 \end{bmatrix} = \begin{bmatrix} 31 - 15 - 14 & -25 - (-25) - 0 \\ -20 - (-20) - 0 & 24 - 10 - 14 \end{bmatrix}$$

Final Answer:

$A^2 - 5A - 14I = 0$ is verified. 2m

7. If A = $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 4 \end{bmatrix}$, then show that $|3A| = 27|A|$. 2m

A:- Determinant of 3A = 108 1m

27X Determinant of A = 27 x 4 = 108 1m

SECTION C

8. Cost of a pen and a note book are Rs. 12 and Rs. 27 respectively. On A given day shopkeeper P sells five pens and seven notebooks whereas another shopkeeper Q sells 6 pens and four note books find the money received by both the booksellers using matrix algebra. 3m

A:- Let A be the matrix representing the quantities of pens and notebooks sold by each shopkeeper.

$$A = \begin{bmatrix} 5 & 7 \\ 6 & 4 \end{bmatrix}$$

The first row represents shopkeeper P, and the second row represents shopkeeper Q. 1m

The first column represents pens, and the second column represents notebooks.

Step 2

Define the cost matrix

Let B be the matrix representing the cost of each item.

$$B = \begin{bmatrix} 12 \\ 27 \end{bmatrix}$$

The first row represents the cost of a pen, and the second row represents the cost of a notebook. 1m

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Step 3

Perform matrix multiplication

Multiply matrix A by matrix B to find the total money received by each shopkeeper.

$$AB = \begin{bmatrix} 5 & 7 \\ 6 & 4 \end{bmatrix} \begin{bmatrix} 12 \\ 27 \end{bmatrix}$$ 1m

$$AB = \begin{bmatrix} (5 \times 12) + (7 \times 27) \\ (6 \times 12) + (4 \times 27) \end{bmatrix}$$

$$AB = \begin{bmatrix} 60 + 189 \\ 72 + 108 \end{bmatrix}$$

$$AB = \begin{bmatrix} 249 \\ 180 \end{bmatrix}$$

Solution

Shopkeeper P received Rs. 249 and shopkeeper Q received Rs. 180.

9. Find the values of k if the area of the triangle with vertices (-2,0) , (0,4) and (0,k) is 4 square units. 3m

A:- The absolute value of ½ (-2)(4-k) = 4 1m

k-4=4,-4 1m

k=8,0 1m

SECTION D

10. Solve the following system of linear equations by Cramer's rule: 5m

6x + y -3z-5=0

x + 3y -2z-5=0

2x+y+4z-8=0

A:- D = 91 1m

D1=91 1m

D2=182 1m

D3=91

x = D1/D = 1,y = 2,z = 1 2m

11. Express the following as the sum of symmetric matrix and a skew symmetric matrix and verify your result. 5m

$$\begin{bmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{bmatrix}$$

A:- ½ (A+A') 2m
½(A-A') 2m
Verification 1m

***********BEST OF LUCK***********