The Kalyani School

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PERIODIC TEST – I (2025–26)
QUESTION PAPER

Subject: Mathematics Band 3 (041) **Grade: XII**

Marks: 25 **Time: 1 Hour**

Name: Aashi **Date: 09-06-2025**

General Instructions:

- This question paper has five compulsory sections: A, B, C, D, and E.
- There is no overall choice in the paper.
- Section A comprises 4 Multiple Choice Questions of 1 mark each.
- Section B comprises 3 Very Short Answer Type Questions of 2 marks each.
- Section C comprises 2 Short Answer Type Questions of 3 marks each.
- Section D comprises 1 Long Answer Type Question of 5 marks.
- Section E has 1 Case Study Question, in which 2 Very Short Answer Type Questions are of 1 mark each and 1 Short Answer Type Question is of 2 marks. An internal choice is provided in the 2 mark question of the Case Study.

Section A

Questions Nos. 1 to 4 carry 1 mark each.

1. Given a skew-symmetric matrix $A = \begin{bmatrix} 0 & a & 1 \\ -1 & b & 1 \\ -1 & c & 0 \end{bmatrix}$ the value of $(a+b+c)^2$ is____.

(a) 0 (b) 2 (c) 3 (d) 4

2. If $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 3 & 1 \\ 3 & a & 1 \end{bmatrix}$ is non-singular matrix and $a \in A$, then the set A is ______.

(a) R (b) {0} (c) {4} (d) R − {4}

3. If $|A| = |kA|$, where A is a square matrix of order 2, then the sum of the possible values of k is ____.

(a) 1 (b) 2 (c) −1 (d) 0

4. In an L.P.P., if the objective function $Z = ax + by$ has the same maximum value on two corner points of the feasible region, then the number of points at which the maximum value of Z occurs is_____.

(a) 1 (b) 2

(c) infinite (d) maximum value does not exist

Section B

Questions Nos. 5 to 7 carry 2 marks each.

5. If X and Y are 2×2 matrices, then solve the following matrix equations for X and Y.

$2X + 3Y = \begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix}$, $3X + 2Y = \begin{bmatrix} -2 & 2 \\ 1 & -5 \end{bmatrix}$

6. Find the value of x such that $\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = 0$.

7. Evaluate: $\begin{vmatrix} a+pd & a+qd & a+rd \\ p & q & r \\ d & d & d \end{vmatrix}$

Section C

Questions Nos. 8 and 9 carry 3 marks each.

8. If $\begin{bmatrix} 2 & -1 \\ 1 & 0 \\ -3 & 4 \end{bmatrix} A = \begin{bmatrix} -1 & -8 & -10 \\ 1 & -2 & -5 \\ 9 & 22 & 15 \end{bmatrix}$, then find A.

9. Maximise $Z = 3x - 4y$

Subject to the constraints:

$x - 2y \leq 0,$

$-3x + y \leq 4$

$x - y \leq 6$

$x, y \geq 0$

Section D

Question No. 10 carries 5 marks.

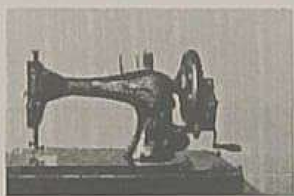
10. Find A^{-1}, where $A = \begin{bmatrix} 4 & 1 & 3 \\ 2 & 1 & 1 \\ 3 & 1 & -2 \end{bmatrix}$. Hence, solve the following system of equations:

$4x + 2y + 3z = 2,\ x + y + z = 1,\ 3x + y - 2z = 5.$

Section E

Question No. 11 is a Case Based Question that has three sub parts. Subparts (i) and (ii) are compulsory and carry one mark each. Subpart (iii) carries 2 marks and has an internal choice.

11. Suppose a dealer in a rural area wishes to sell several sewing machines. He has only ₹ 5760 to invest and has space for, at most, 20 items for storage. An electronic sewing machine costs him ₹ 360, and a manually operated sewing machine costs ₹ 240. He can sell an electronic sewing machine at a profit of ₹ 22 and a manually operated sewing machine at a profit of ₹ 18.



Based on the above information, answer the following questions:

(i) Write the constraints of the given problem.

(ii) Find the corner points of its feasible region.

(iii) If the objective function of the given problem is $z = 22x + 18y$, then find its maximum value.

OR

(iii) If the objective function of the given problem is $z = 22x + 18y$, then find its minimum value.