BOARD PAPER QUESTIONS

1. Evaluate without using tables:

$$\begin{pmatrix} 2\cos 60° & -2\sin 30° \\ -\tan 45° & \cos 0° \end{pmatrix} \cdot \begin{pmatrix} \cot 45° & \operatorname{cosec} 30° \\ \sec 60° & \sin 90° \end{pmatrix}$$

[1997]

2. Find the value of x and y, if

$$\begin{bmatrix} 1 & 2 \\ 3 & 3 \end{bmatrix} \begin{bmatrix} x & 0 \\ 0 & y \end{bmatrix} = \begin{bmatrix} x & 0 \\ 9 & 0 \end{bmatrix}.$$ **[1998]**

3. Find the 2 × 2 matrix X which satisfies the equation.

$$\begin{bmatrix} 3 & 7 \\ 2 & 4 \end{bmatrix} \begin{bmatrix} 0 & 2 \\ 5 & 3 \end{bmatrix} + 2\,X = \begin{bmatrix} 1 & -5 \\ -4 & 6 \end{bmatrix}$$ **[1999]**

4. Given $A = \begin{bmatrix} 1 & 1 \\ 8 & 3 \end{bmatrix}$, evaluate $A^2 - 4A$. **[2000]**

5. Find x and y, if:

$$\begin{bmatrix} -3 & 2 \\ 0 & -5 \end{bmatrix} \begin{bmatrix} x \\ 2 \end{bmatrix} = \begin{bmatrix} -5 \\ y \end{bmatrix}$$ **[2001]**

6. Find x and y, if:

$$\begin{bmatrix} 3 & -2 \\ -1 & 4 \end{bmatrix} \begin{bmatrix} 2x \\ 1 \end{bmatrix} + 2\begin{bmatrix} -4 \\ 5 \end{bmatrix} = 4\begin{bmatrix} 2 \\ y \end{bmatrix}$$ **[2003]**

7. Find the value of x given that $A^2 = B$

$$A = \begin{bmatrix} 2 & 12 \\ 0 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 4 & x \\ 0 & 1 \end{bmatrix}$$ **[2005]**

8. If $2\begin{bmatrix} 3 & 4 \\ 5 & x \end{bmatrix} + \begin{bmatrix} 1 & y \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 7 & 0 \\ 10 & 5 \end{bmatrix}$

find the values of x and y. **[2007]**

9. Let $A = \begin{bmatrix} 1 & 0 \\ 2 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 3 \\ -1 & 0 \end{bmatrix}$. Find $A^2 + AB + B^2$.

[2007]

10. If $\begin{bmatrix} 1 & 4 \\ -2 & 3 \end{bmatrix} + 2\,M = 3\begin{bmatrix} 3 & 2 \\ 0 & -3 \end{bmatrix}$, find the matrix M.

[2008]

11. Given $A = \begin{bmatrix} p & 0 \\ 0 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 0 & -q \\ 1 & 0 \end{bmatrix}$, $C = \begin{bmatrix} 2 & -2 \\ 2 & 2 \end{bmatrix}$ and

$BA = C^2$. Find the values of p and q. **[2008]**

12. Find x and y, if $\begin{bmatrix} 2x & x \\ y & 3y \end{bmatrix} \begin{bmatrix} 3 \\ 2 \end{bmatrix} = \begin{bmatrix} 16 \\ 9 \end{bmatrix}$. **[2009]**

13. Given $A = \begin{bmatrix} 3 & -2 \\ -1 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 6 \\ 1 \end{bmatrix}$, $C = \begin{bmatrix} -4 \\ 5 \end{bmatrix}$ and

$D = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$. Find AB + 2C – 4D. **[2010]**

14. Evaluate

$$\begin{bmatrix} 4\sin 30° & 2\cos 60° \\ \sin 90° & 2\cos 0° \end{bmatrix} \begin{bmatrix} 4 & 5 \\ 5 & 4 \end{bmatrix}$$ **[2010]**

15. If $A = \begin{bmatrix} 3 & 5 \\ 4 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 \\ 4 \end{bmatrix}$, is the product AB

possible? Give a reason. If yes, find AB. **[2011]**

16. If $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 4 & -2 \\ -1 & 3 \end{bmatrix}$ and I is the identity

matrix of the same order and A^t is the transpose of matrix A, and $A^t.B + BI$. **[2011]**

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

[2012]

18. Given $A = \begin{bmatrix} 2 & -6 \\ 2 & 0 \end{bmatrix}$, $B = \begin{bmatrix} -3 & 2 \\ 4 & 0 \end{bmatrix}$, $C = \begin{bmatrix} 4 & 0 \\ 0 & 2 \end{bmatrix}$.

Find the matrix X such that A + 2X = 2B + C.

[2013]

19. Find x and y if $\begin{bmatrix} x & 3x \\ y & 4y \end{bmatrix} \begin{bmatrix} 2 \\ 1 \end{bmatrix} = \begin{bmatrix} 5 \\ 12 \end{bmatrix}$. **[2013]**

20. Find x, y if $\begin{bmatrix} -2 & 0 \\ 3 & 1 \end{bmatrix} \begin{bmatrix} -1 \\ 2x \end{bmatrix} + 3\begin{bmatrix} -2 \\ 1 \end{bmatrix} = 2\begin{bmatrix} y \\ 3 \end{bmatrix}$.

[2014]

21. Let $A = \begin{bmatrix} 2 & 1 \\ 0 & -2 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 1 \\ -3 & -2 \end{bmatrix}$ and $C = \begin{bmatrix} -3 & 2 \\ -1 & 4 \end{bmatrix}$.

Find $A^2 + AC - 5B$. **[2014]**

22. If $A = \begin{bmatrix} 3 & x \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 9 & 16 \\ 0 & -y \end{bmatrix}$, find x and y when $A^2 = B$. **[2015]**

23. If $A = \begin{bmatrix} 3 & 7 \\ 2 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 2 \\ 5 & 3 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & -5 \\ -4 & 6 \end{bmatrix}$, find $AB - 5C$. **[2015]**

24. Given $A = \begin{bmatrix} 2 & 0 \\ -1 & 7 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $A^2 = 9A + mI$. Find m. **[2016]**

25. If $A = \begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 4 \\ -1 & 7 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 0 \\ -1 & 4 \end{bmatrix}$, find $AC + B^2 - 10C$. **[2018]**

26. Simplify:

$$\sin A \begin{bmatrix} \sin A & -\cos A \\ \cos A & \sin A \end{bmatrix} + \cos A \begin{bmatrix} \cos A & \sin A \\ -\sin A & \cos A \end{bmatrix}$$

[2019]

COMMON ERRORS

1. While multiplying matrices, forgetting that any number multiplied by zero is zero.
2. When asked to find A – B + C, students tend to add B and C and subtract this from A, which is wrong. Either, find the difference A – B first and then add C to this difference or add A and C and from this sum, subtract B.
3. When A and B are two given matrices and to find X when AX = B. After finding the elements of X, in the final answer, students forget to write X in matrix form.

POINTS AT A GLANCE

1. $A_{m \times \boxed{n}} \times B_{\boxed{p} \times q} = P_{m \times q}$

A and B can be multiplied only if $n = p$ (No. of columns in A = No. of rows in B)

2. Square Matrix × Column Matrix = Column Matrix

e.g., $\begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix} \begin{bmatrix} 7 \\ 8 \end{bmatrix} = \begin{bmatrix} 21 + 32 \\ 35 + 48 \end{bmatrix} = \begin{bmatrix} 53 \\ 83 \end{bmatrix}$

3. Row Matrix × Matrix = Row Matrix

e.g., $[5 \quad 2] \begin{bmatrix} 4 & 8 \\ 7 & 3 \end{bmatrix} = [20 + 14 \quad 40 + 6] = [34 \quad 36]$

4. $AI = A = IA$ where I is identity matrix $I_{2 \times 2} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$.

5. $(A + B)^2 \neq A^2 + 2AB + B^2$ in matrices because $AB \neq BA$.

$(A - B)^2 \neq A^2 - 2AB + B^2$ and $A^2 - B^2 \neq (A + B)(A - B)$

Only in some cases where $AB = BA$, these will be equal.