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Class : 11  
Date: 27/06/2021  
Time: 3 hours

## General Instructions:

- Answers to this Paper must be written on the paper provided separately.
- The time given at the head of this Paper is the time allowed for writing the answers.
- All working, including rough work, must be clearly shown and must be done on the same sheet as the rest of the answers.
- Omission of essential working will result in the loss of marks.
- Maximum marks : **75**
- The intended marks for questions or parts of questions are given in brackets [].

## All the very best...

1. State, whether the following statements are true or false. If false, give a reason.

**[3 Marks]**

(i) If A and B are two matrices of orders  $3 \times 2$  and  $2 \times 3$  respectively; then their sum  $A + B$  is possible.

(ii) The matrices  $A_{2 \times 3}$  and  $B_{2 \times 3}$  are conformable for subtraction.

(iii) Transpose of a  $2 \times 1$  matrix is a  $2 \times 1$  matrix.

2. **[2 Marks]**

If  $A = \begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}$  then show that  $A^2 = -I$

3. **[2 Marks]**

Find the additive inverse of  $A = \begin{bmatrix} i & 0 & 1 \\ 0 & -i & 2 \\ -1 & 1 & 5 \end{bmatrix}$  [Hint : additive inverse of A is -A]

4. **[2 Marks]**

Find the minors of -1 and 3 in the matrix  $\begin{bmatrix} 2 & -1 & 4 \\ 0 & -2 & 5 \\ -3 & 1 & 3 \end{bmatrix}$

5. **[2 Marks]**

Find the co-factors of the elements 2, -5 in the matrix  $\begin{bmatrix} -1 & 0 & 5 \\ 1 & 2 & -2 \\ -4 & -5 & 3 \end{bmatrix}$

6. **[4 Marks]**

If  $A = \begin{bmatrix} 0 & 4 & -2 \\ -4 & 0 & 8 \\ 2 & -8 & x \end{bmatrix}$  is a skew symmetric matrix, find the value of x

7. [4 Marks]

Define rank of matrix and find the rank of the following matrices

$$\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 2 & 1 \end{bmatrix}$$

8. [7 Marks]

Show that  $1^2 + (1^2 + 2^2) + (1^2 + 2^2 + 3^2) + \dots$  upto n terms  $= \frac{n(n+1)^2(n+2)}{12}, \forall n \in \mathbb{N}$ .

9. [7 Marks]

If  $A = \begin{bmatrix} 1 & -2 & 3 \\ 0 & -1 & 4 \\ -2 & 2 & 1 \end{bmatrix}$  then find  $(A^{-1})^{-1}$

10. [7 Marks]

Show that  $\begin{vmatrix} bc & b+c & 1 \\ ca & c+a & 1 \\ ab & a+b & 1 \end{vmatrix} = (a-b)(b-c)(c-a)$ .

11. [7 Marks]

If  $A = \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}$  then show that  $A^n = \begin{bmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{bmatrix} \forall n \in \mathbb{N}$  by using mathematical induction

12. [7 Marks]

Show that  $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$

13. [7 Marks]

Show that  $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} = \begin{vmatrix} 2bc - a^2 & c^2 & b^2 \\ c^2 & 2ac - b^2 & a^2 \\ b^2 & a^2 & 2ab - c^2 \end{vmatrix} = (a^3 + b^3 + c^3 - 3abc)^2$

14. [7 Marks]

Examine whether the following system of equations are consistent (or) inconsistent and if consistent find the complete solution.  
 $x + y + z = 1, 2x + y + z = 2, x + 2y + 2z = 1$

15. [7 Marks]

Examine whether the following system of equations are consistent (or) inconsistent and if consistent find the complete solution.  
 $x + y + z = 6, x - y + z = 2, 2x - y + 3z = 9$