

## Topic :-MATRICES

1. If  $A$  is a  $3 \times 4$  matrix and  $B$  is a matrix such that  $A^T B$  and  $BA^T$  are both defined, then order of  $B$  is
  - a)  $3 \times 4$
  - b)  $3 \times 3$
  - c)  $4 \times 4$
  - d)  $4 \times 3$
  
2. If  $X = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ , then the value of  $X^n$  is
  - a)  $\begin{bmatrix} 3n & -4n \\ n & -n \end{bmatrix}$
  - b)  $\begin{bmatrix} 2+n & 5-n \\ n & -n \end{bmatrix}$
  - c)  $\begin{bmatrix} 3^n & (-4)^n \\ 1^n & (-1)^n \end{bmatrix}$
  - d) None of these
  
3. Let  $f(\alpha) = \begin{bmatrix} \cos \alpha & -\sin \alpha & 0 \\ \sin \alpha & \cos \alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$ , where  $\alpha \in R$ . Then,  $(f(\alpha))^{-1}$  is equal to
  - a)  $F(-\alpha)$
  - b)  $F(\alpha^{-1})$
  - c)  $F(2\alpha)$
  - d) None of these
  
4. For any square matrix  $A$ ,  $AA^T$  is a
  - a) Unit matrix
  - b) Symmetric matrix
  - c) Skew-symmetric matrix
  - d) Diagonal matrix
  
5. If  $A$  is a square matrix of order  $n \times n$ , then  $\text{adj}(\text{adj } A)$  is equal to
  - a)  $|A|^{n-1}A$
  - b)  $|A|^{n-1}A$
  - c)  $|A|^{n-2}A$
  - d)  $|A|^{n-3}A$
  
6. If a system of the equations  $(\alpha + 1)^3x + (\alpha + 2)^3y - (\alpha + 3)^3 = 0$ ,  $(\alpha + 1)x + (\alpha + 2)y - (\alpha + 3) = 0$ , and  $x + y - 1 = 0$  is consistent. What is the value of  $\alpha$ ?
  - a) 1
  - b) 0
  - c) -3
  - d) -2
  
7. If  $A = \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}$ , then  $\lim_{n \rightarrow \infty} \frac{1}{n} A^n$  is
  - a) A null matrix
  - b) An identity matrix
  - c)  $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$
  - d) None of these
  
8. If  $A = \begin{bmatrix} \cos^2 \alpha & \cos \alpha \sin \alpha \\ \cos \alpha \sin \alpha & \sin^2 \alpha \end{bmatrix}$   
and,  $B = \begin{bmatrix} \cos^2 \beta & \cos \beta \sin \beta \\ \cos \beta \sin \beta & \sin^2 \beta \end{bmatrix}$   
are two matrices such that the product  $AB$  is the null matrix, then  $(\alpha - \beta)$  is
  - a) 0
  - b) Multiple of  $\pi$
  - c) An odd multiple of  $\pi/2$

- d) None of these
9. If  $A$  be a square matrix of order  $n$  and if  $|A| = D$  and  $|\text{adj } A| = D'$ , then  
 a)  $DD' = D^2$                       b)  $DD' = D^{-1}$                       c)  $DD' = D^n$                       d) None of these
10. If  $1, \omega, \omega^2$  are the cube roots of unity and if  
 $\begin{bmatrix} 1 + \omega & 2\omega \\ -2\omega & -b \end{bmatrix} + \begin{bmatrix} a - \omega & \\ 3\omega & 2 \end{bmatrix} = \begin{bmatrix} 0 & \omega \\ \omega & 1 \end{bmatrix}$ , then  $a^2 + b^2$  is equal to  
 a)  $1 + \omega^2$                       b)  $\omega^2 - 1$                       c)  $1 + \omega$                       d)  $(1 + \omega)^2$
11. If a square matrix  $A$  is orthogonal as well as symmetric, then  
 a)  $A$  is involutory matrix  
 b)  $A$  is idempotent matrix  
 c)  $A$  is a diagonal matrix  
 d) None of these
12. The real value of  $k$  for which the system of equations  
 $2kx - 2y + 3z = 0, x + ky + 2z = 0, 2x + kz = 0$ , has non-trivial solution is  
 a) 2                      b) -2                      c) 3                      d) -3
13. If the matrices  $A = \begin{bmatrix} 2 & 1 & 3 \\ 4 & 1 & 0 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 5 & 0 \end{bmatrix}$ , then  $AB$   
 a)  $\begin{bmatrix} 17 & 0 \\ 4 & -2 \end{bmatrix}$                       b)  $\begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix}$                       c)  $\begin{bmatrix} 17 & 4 \\ 0 & -2 \end{bmatrix}$                       d)  $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$
14. If  $A = \begin{bmatrix} a & 0 \\ 1 & 1 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$ , then value of  $a$  for which  $A^2 = B$  is  
 a) 1                      b) -1                      c) 4                      d) No real values
15. If  $E(\theta) = \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}$ , then  $E(\alpha)E(\beta)$  is equal to  
 a)  $E(0^\circ)$                       b)  $E(\alpha\beta)$                       c)  $E(\alpha + \beta)$                       d)  $E(\alpha - \beta)$
16. If  $A = \begin{bmatrix} b & b^2 \\ -a^2 & -ab \end{bmatrix}$ , then  $A$  is  
 a) Idempotent                      b) Involutory                      c) Nilpotent                      d) Scalar
17. The matrix  $A = \begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \end{bmatrix}$  is  
 a) Unitary                      b) Orthogonal                      c) Nilpotent                      d) Involutory
18. Let  $X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$ ,  $A = \begin{bmatrix} 1 & -1 & 2 \\ 2 & 0 & 1 \\ 3 & 2 & 1 \end{bmatrix}$  and  $B = \begin{bmatrix} 3 \\ 1 \\ 4 \end{bmatrix}$ . If  $AX = B$ , then  $X$  is equal to

a)  $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$

b)  $\begin{bmatrix} -1 \\ -2 \\ 3 \end{bmatrix}$

c)  $\begin{bmatrix} -1 \\ -2 \\ -3 \end{bmatrix}$

d)  $\begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}$

19. If  $A$  is a skew-symmetric matrix of odd order, then  $|\text{adj } A|$  is equal to

a) 0

b)  $n$

c)  $n^2$

d) None of these

20. The system of equations  $x + 3y + 2z = 0$ ,  $3x + y + z = 0$  and  $2x - 2y - z = 0$

a) Possesses a trivial solution only

b) Possesses a non-zero unique solution

c) Does not have a common non-zero solution

d) Has infinitely many solutions

PE