1. $F(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and

$G(x) = \begin{bmatrix} \cos x & 0 & \sin x \\ 0 & 1 & 0 \\ -\sin x & 0 & \cos x \end{bmatrix}$, then $[F(x)\,G(y)]^{-1}$ is equal to -

(a) F(-x) G (-y) (b) F(x -1) G(y -1)
(c) G (-y) F(-x) (d) $G(y^{-1})\,F(x^{-1})$

2. If $3A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ x & 2 & y \end{bmatrix}$ and $A.\,A^t = I$, then x + y equal to

(a) -1 (b) 1 (c) 2 (d) None of these

3. If $A_r = \begin{pmatrix} r & r-1 \\ r-1 & r \end{pmatrix}$ where r is a natural number then $|A_1| + |A_2| + |A_3| + ...+ |A_{2006}|$ must be equal to

(a) 2006 (b) $(2006)^2$ (c) $(2006)^3$ (d) 2007

4. If $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ or $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then which of the following holds of all $n \geq 1$,

(a) $A^n = nA - (n - 1)\,I$ (b) $A^n = 2^{n-1}A - (n - 1)I$
(c) $A^n = nA + (n - 1)I$ (d) $A^n = 2^{n-1}A + (n - 1)\,I$

5. The matrix $\begin{bmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{bmatrix}$ is a -

(a) Skew symmetric (b) Symmetric matrix
(c) Null matrix (d) None of these

6. If A is a skew symmetric matrix and n is odd positive integer then A^n is -

(a) Symmetric matrix (b) Diagonal matrix
(c) Skew symmetric matrix (d) None of these

7. If $A = \frac{1}{9}\begin{bmatrix} -8 & 1 & 4 \\ 4 & 4 & 7 \\ 1 & -8 & 4 \end{bmatrix}$ then A is -

(a) Involutary matrix (b) Idempotent matrix
(c) Orthogonal matrix (d) Nilpotent matrix

8. A and B are square matrices and A is non-singular matrix, (A-1BA)n, n ∈ I+, is equal to

(a) A-nBnAn (b) AnBnA-n (c) A-1BnA (d) A-nBAn

9. Let $A \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ are two matrices such that $AB = BA$ and $c \neq 0$, then value of $\frac{a-d}{3b-c}$ is

(a) 0 (b) 2 (c) -2 (d) - 1

10. If $A^3 = O$, then $I + A + A^2$ equals

(a) I - A (b) $(I - A)^{-1}$ (c) $(I + A)^{-1}$ (d) None of these

11. Consider the matrix A, B, C, D with order 2 × 3, 3×4, 4×4, 4×2 respectively. Let $x = (\alpha\ A\ B\ \gamma\ C^2\ D)^3$ where $\alpha \& \gamma$ are scalars . Let $|x| = k|ABC^2D|^3$, then k is

(a) $\alpha\gamma$ (b) $\alpha^2\gamma^2$ (c) $\alpha^4\gamma^4$ (d) $\alpha^6\gamma^6$

12. If $A = \begin{bmatrix} 4 & x+2 \\ 2x-3 & x+1 \end{bmatrix}$ is symmetric, then x =

(a) 3 (b) 5 (c) 2 (d) 4

13. If U = [2, - 3, 4], $V = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$, X = [0, 2, 3] and

$Y = \begin{bmatrix} 2 \\ 2 \\ 4 \end{bmatrix}$, then UV + XY =

(a) 20 (b) [-20] (c) -20 (d) [20]

14. If $A = \begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$, then adj A =

(a) A (b) A^T (c) 3A (d) $3A^T$

15. If $3A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ x & 2 & y \end{bmatrix}$ and A is orthogonal, then x + y =

(a) 3 (b) - 2 (c) -3 (d) None

16. If A satisfies the equation $x^3 - 5x^2 + 4x + k = 0$, then A^{-1} exists if -

(a) $k \neq 1$ (b) $k \neq 3$ (c) $k \neq -1$ (d) None

17. If B is non-singular matrix and A is a square matrix of same size, then det $(B^{-1}AB)$ =

(a) $|A^{-1}|$ (b) $|B^{-1}|$ (c) |B| (d) |A|

18. If A and B are square matrices of same size and $|B| \neq 0$, then $(B^{-1}AB)^4$ =

(a) $(B^4)^{-1}AB^4$ (b) BA^4B^{-1} (c) $B^{-1}A^4B$ (d) None

19. If AB = I and B = A' then :

(a) $A^{-1} = A'$ (b) $A^{-1} = A$ (c) $A^{-1} = A^2$ (d) None

20. If the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & \lambda \end{bmatrix}$ is singular, then λ equal to -

(a) - 5 (b) 1 (c) 3 (d) -1

21. Let $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$. If U_1, U_2, U_3 are column matrices satisfying $AU_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$, $AU_2 = \begin{bmatrix} 2 \\ 3 \\ 0 \end{bmatrix}$, $AU_3 = \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix}$ and U is 3×3 matrix whose columns are U_1, U_2 and U_3. Then $|U| =$

(a) 3 (b) 3/2 (c) -3 (d) 2

22. Matrix $A = \begin{bmatrix} x & 3 & 2 \\ 1 & y & 4 \\ 2 & 2 & z \end{bmatrix}$, If $xyz = 60$ and $8x + 4y + 3z = 20$, then A(adj A) is equal to:

(a) $\begin{bmatrix} 64 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 64 \end{bmatrix}$ (b) $\begin{bmatrix} 88 & 0 & 0 \\ 0 & 88 & 0 \\ 0 & 0 & 88 \end{bmatrix}$

(c) $\begin{bmatrix} 68 & 0 & 0 \\ 0 & 68 & 0 \\ 0 & 0 & 68 \end{bmatrix}$ (d) $\begin{bmatrix} 34 & 0 & 0 \\ 0 & 34 & 0 \\ 0 & 0 & 34 \end{bmatrix}$

23. A and B are two given matrices such that the order of A is 3×4, If $A'B$ and BA' are both defined then:

(a) Order of B' is 3×4 (b) Order of $B'A$ is 4×4

(c) Order of $B'A$ is 3×3 (d) $B'A$ is not defined

24. Let $E(\alpha) = \begin{bmatrix} \cos^2\alpha & \cos\alpha\sin\alpha \\ \cos\alpha\sin\alpha & \sin^2\alpha \end{bmatrix}$. If α and β differs by an odd multiple of $\pi/2$, then $E(\alpha)\,E(\beta)$ is a -

(a) Null matrix (b) Unit matrix

(c) Diagonal matrix (d) Orthogonal matrix

25. The inverse of a skew symmetric matrix (if it exists) is -

(a) A symmetric matrix (b) A skew symmetric matrix

(c) Diagonal matrix (d) None of these

26. Let A, B, C be three square matrices of the same order, such that whenever AB = AC then B = C, if A is -

(a) Singular (b) Non-singular

(c) Symmetric (d) Skew-symmetric

27. If A and B are two square matrices such that $B = -A^{-1}BA$, then $(A + B)^2$ is equal to -

(a) 0 (b) $A^2 + B^2$ (c) $A^2 + 2AB + B^2$ (d) A + B

28. If A is non-singular matrix of order 3×3, then adj (adj A) is equal to -

(a) |A| A (b) $|A|^2$ A (c) $|A|^{-1}$ A (d) None of these

29. The value of a for which the system of equations

$x + y + z = 0$

$ax + (a + 1)y + (a + 2)z = 0$ $a^3x + (a + 1)^3y + (a + 2)^3z = 0$

has a non-zero solution is -

(a) 1 (b) 0 (c) -1 (d) None of these

30. Let $A = \begin{bmatrix} 2 & 3 \\ -1 & 5 \end{bmatrix}$ if $A^{-1} = xA + yI_2$ then x and y are respectively -

(a) $\frac{1}{13}, \frac{-7}{13}$ (b) $\frac{7}{13}, \frac{-1}{13}$ (c) $\frac{-1}{13}, \frac{7}{13}$ (d) $\frac{-7}{13}, \frac{1}{13}$

31. If A is a square matrix such that $A^2 = A$, then |A| equals-

(a) 0 or 1 (b) -2 or 2 (c) -3 or 3 (d) None of these

32. If A, B and C are three square matrices of the same size such that $B = CAC^{-1}$, then CA^3C^{-1} is equal to -

(a)B (b) B^2 (c) B^3 (d) B^9

33. If A & B are two square matrices such that $B = A^{-1}BA$, then $(A + B)^2$ equals-

(a) 0 (b) $A^2 + B^2$ (c) $A^2 + 2AB + B^2$ (d) A + B

34. If $A = \begin{bmatrix} 1 & 1/2 \\ 0 & 1 \end{bmatrix}$ then A^{64} is :

(a) $\begin{bmatrix} 1 & 32 \\ 32 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 \\ 32 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 32 \\ 0 & 1 \end{bmatrix}$

(d) None

35. if $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 1 & 2 \\ 2 & 3 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 & -2 \\ 0 & -6 \\ -1 & 2 \end{bmatrix}\begin{bmatrix} 2 \\ 1 \end{bmatrix}$ then (x, y, z) is equal to -

(a) (-4, 2, 2) (b) (4, 2, 2)

(c) (-4, -2, -2) (d) (4, -2, -2)

36. Let matrix $A = \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$ where a, b, c are real positive numbers with abc = 1. If $A^T A = I$, then $a^3 + b^3 + c^3 =$

(a) 3 (b) 2 (c) 4 (d) None

37. Matrix M_r is defined as $M_r = \begin{bmatrix} r & r-1 \\ r-1 & r \end{bmatrix}$, $r \in N$. Then det. (M_1) + det.(M_2) + ... + det.(M_{2009}) = ?

(a) 2009 (b) $(2009)^2$

(c) $(2009)^3$ (d) None of these

38. Let $A = \begin{bmatrix} -1 & 2 & -3 \\ -2 & 0 & 3 \\ 3 & -3 & 1 \end{bmatrix}$ be a matrix, then (determinant of A) × (adjoint of inverse of A) is equal to-

(a) $O_{3\times 3}$ (b) $\begin{bmatrix} -1 & 2 & -3 \\ -2 & 0 & 3 \\ 3 & -3 & 1 \end{bmatrix}$

(c) I_3 (d) $\begin{bmatrix} -3 & -3 & 1 \\ 3 & 0 & -2 \\ -1 & 2 & -3 \end{bmatrix}$

39. If the matrix $\begin{bmatrix} 1 & 3 & \lambda+2 \\ 2 & 4 & 8 \\ 3 & 5 & 10 \end{bmatrix}$ is singular, then the value of λ is :

(a) 1 (b) 4 (c) 2 (d) 3

40. If A is a skew-symmetric matrix, then trace of A is

(a) 0 (b) - 1 (c) 1 (d) None of these