MATRICES

OBJECTIVES

1. **Let a_{ij} denote the element of the ith row and jth column is a 3×3 matrix also $a_{ij} = -a_{ji}$ every i and j. Then each element of the principle diagonal of the matrix is**

   a) – 1 b) 1 c) 0 d) 2

2. **$A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ and $f(x) = x^2 - 4x - 5$ then f(A) =**

   a) 2I b) –4I c) 0 d) 3I

3. **If A, B are two square matrices such that AB = B; BA = A and $n \in N$ then $(A+ B)^n$ =**

   a) $2^n(A + B)$ b) $2^{n-1}(A + B)$
   c) $2^{n+1}(A + B)$ d) $2^{n-2}(A + B)$

4. **If the matrix $\begin{bmatrix} 0 & 2\beta & \gamma \\ \alpha & \beta & -\gamma \\ \alpha & -\beta & \gamma \end{bmatrix}$ is orthogonal then**

   a) $\alpha = \pm \frac{1}{\sqrt{2}}$ b) $\beta = \pm \frac{1}{\sqrt{6}}$ c) $\gamma = \pm \frac{1}{\sqrt{3}}$ d) All the above

5. **The number of non zero diagonal matrices, if $A^2 = A$ is**

   a) 6 b) 7
   c) 8 d) Infinitely many

6. **If A and B are two square matrices of order n and A and B commute then for any real number k**

   a) A – kI, B – kI are not commute b) A – kI, B – kI are commute
   c) A – kI = B – kI d) A – kI, k – BI are commute

7. **If A = $\begin{pmatrix} 4 & 1 & 0 \\ 1 & -2 & 2 \end{pmatrix}$, B = $\begin{pmatrix} 2 & 0 & -1 \\ 3 & 1 & 4 \end{pmatrix}$, C = $\begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix}$ and (3B – 2A) C + 2X = 0 then X =**

a) $\frac{1}{2}\begin{bmatrix} 3 \\ 13 \end{bmatrix}$ b) $\frac{1}{2}\begin{bmatrix} 3 \\ -13 \end{bmatrix}$ c) $\frac{1}{2}\begin{bmatrix} -3 \\ 13 \end{bmatrix}$ d) $\begin{bmatrix} -3 \\ 13 \end{bmatrix}$

8. **If A = $\begin{pmatrix} 2 & 3 \\ 0 & 4 \end{pmatrix}$ then $A^2 - 5I$ =**

a) $\begin{pmatrix} -1 & 13 \\ -5 & -11 \end{pmatrix}$ b) $\begin{pmatrix} -1 & -13 \\ 5 & 11 \end{pmatrix}$ c) $\begin{pmatrix} -1 & 18 \\ 0 & 11 \end{pmatrix}$ d) $\begin{pmatrix} 1 & 13 \\ 5 & 11 \end{pmatrix}$

9. **If A(α) = $\begin{pmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{pmatrix}$ then A(α) A(β) =**

a) A(α)– A(β) b) A(α) + A(β) c) A(α– β) d) A(α + β)

10. **If A = $\begin{bmatrix} -1 & 0 \\ 0 & 2 \end{bmatrix}$ then $A^3 - A^2$ =**

a) 2A b) 2I c) A d) I

11. **If A = $\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ then $A^3 - 4A^2 - 6A$ =**

a) 0 b) A c) – A d) I

12. **If A = $\begin{pmatrix} 1 & 3 & -5 \\ 2 & -1 & 5 \\ 1 & 0 & 1 \end{pmatrix}$ then the trace of A is**

a) 1 b) – 1 c) 3 d) 2

13. **If A = [a_{ij}] is a scalar matrix of order n × n such that a_{ij} = k for all i, then trace of A =**

a) nk b) n + k c) n / k d) n – k

14. **If A =** $\begin{bmatrix} 4 & x+2 \\ 2x-3 & x+1 \end{bmatrix}$ **is symmetric then trace of A is**

a) 5 b) – 10 c) 10 d) 15

15. **P + Q =** $\begin{pmatrix} 2 & 3 & 5 \\ 4 & 1 & 2 \\ 1 & 2 & 1 \end{pmatrix}$**, P is symmetric, Q is a skew symmetric matrix then Q =**

a) $\begin{pmatrix} 0 & \frac{-1}{2} & 2 \\ \frac{1}{2} & 0 & 0 \\ -2 & 0 & 0 \end{pmatrix}$ b) $\begin{pmatrix} 0 & \frac{1}{2} & 1 \\ \frac{-1}{2} & 0 & 0 \\ -1 & 0 & 0 \end{pmatrix}$

c) $\begin{pmatrix} 0 & 1 & 0 \\ -1 & 0 & 1 \\ 0 & -1 & 0 \end{pmatrix}$ d) $\begin{pmatrix} 0 & 2 & 3 \\ -2 & 0 & 4 \\ -3 & -4 & 0 \end{pmatrix}$

16. **If 3A + 4B^T =** $\begin{pmatrix} 7 & -10 & 17 \\ 0 & 6 & 31 \end{pmatrix}$ **and 2B – 3A^T =** $\begin{pmatrix} -1 & 18 \\ 4 & -6 \\ -5 & -7 \end{pmatrix}$ **then B =**

a) $\begin{pmatrix} 1 & 3 \\ -1 & 0 \\ -2 & -4 \end{pmatrix}$ b) $\begin{pmatrix} 1 & 3 \\ 1 & 0 \\ 2 & 4 \end{pmatrix}$ c) $\begin{pmatrix} 1 & 3 \\ -1 & 0 \\ 2 & 4 \end{pmatrix}$ d) $\begin{pmatrix} -1 & -3 \\ 1 & 0 \\ 2 & 4 \end{pmatrix}$

17. **If A =** $\begin{pmatrix} \cos\alpha & \sin\alpha & 0 \\ -\sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{pmatrix}$ **then A A^T = A^{T}A =**

a) O b) – I c) I d) 2I

18. **If A =** $\begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$ **then A is**

a) Idempotent matrix b) Involutory matrix

c) Nilpotent matrix of index 2 d) Nilpotent matrix of index 3

19. **If A =** $\begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ **then A is**

a) Idempotent matrix b) Involutory matrix

c) Nilpotent of index 2 d) Nilpotent of index 3

20. **If A is a square matrix then $A - A^T$ is a …… matrix**

a) Symmetric b) Skew symmetric

c) Hermitian d) Triangular

21. **If A, B are symmetric matrices of the same order then AB – BA is**

a) Symmetric matrix b) Skew symmetric matrix

c) Diagonal matrix d) Identity matrix

22. **If B is an idempotent matrix and A = I – B then AB =**

a) I b) O c) – I d) B

23. **If A =** $\begin{bmatrix} a^2 & ab & ac \\ ab & b^2 & bc \\ ac & bc & c^2 \end{bmatrix}$ **and $a^2 + b^2 + c^2 = 1$ then A^2 =**

a) 2A b) A c) 3A d) ½ A

24. **If A =** $\begin{bmatrix} a & b \\ b & a \end{bmatrix}$ **and A^2 =** $\begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$ **then**

a) $\alpha = a^2 + b^2$; $\beta = 2ab$ b) $\alpha = a^2 + b^2$; $\beta = a^2 - b^2$

c) $\alpha = 2ab$; $\beta = a^2 + b^2$ d) $\alpha = a^2 + b^2$; $\beta = ab$

25. **A =** $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 2 & 1 \\ 1 & 0 & 3 \end{pmatrix}$ **then (A – I) (A – 2I) (A – 3I) =**

a) 1 b) 0 c) A d) ½ A

26. **If AB = A, BA = B, then $A^2 + B^2$ =**

a) A + B b) A – B c) AB d) 0

27. **If A =** $\begin{pmatrix} \cos^2\alpha & \cos\alpha\sin\alpha \\ \cos\alpha\sin\alpha & \sin^2\alpha \end{pmatrix}$ **and**

B = $\begin{pmatrix} \cos^2\beta & \cos\beta\sin\alpha \\ \cos\beta\sin\beta & \sin^2\alpha \end{pmatrix}$ **are two matrices such that the product AB is the null matrix then $\alpha - \beta$ =**

a) 0 b) Multiple of π

c) An odd multiple of π/2 d) None

28. **If A and B are square matrices of size $n \times n$ such that $A^2 - B^2 = (A - B)(A + B)$ then which of the following will be always true?**

a) A = B
b) AB = BA
c) Either of A or B is a zero matrix
d) Either of A or B is an identity matrix

29. **Let A =** $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$**, B =** $\begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix}$**, a, b $\in$ N then**

a) There cannot exist any B such that AB = BA
b) There exist more than one but finite number of B's such that AB = BA
c) There exists exactly one B such that AB + BA
d) There exist infinitely may B's such that AB = BA

30. **If A =** $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$**; I =** $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ **then which one of the following holds for all $n \geq 1$, by the principle of mathematical induction**

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) $A^n = 2^{n-1}A + (n-1)I$

31. **If A =** $\begin{pmatrix} 3 & -4 \\ 1 & -1 \end{pmatrix}$ **then A^n =**

a) $\begin{pmatrix} 3n & -4n \\ n & -n \end{pmatrix}$
b) $\begin{pmatrix} 2+n & 5-n \\ n & -n \end{pmatrix}$
c) $\begin{pmatrix} 3^n & (-4)^n \\ 1^n & (-1)^n \end{pmatrix}$
d) $\begin{pmatrix} 1+2n & -4n \\ n & 1-2n \end{pmatrix}$

32. **If $A^2 = 2A - I$ then for $n \neq 2$, A^n =**

a) $nA - (n-1)I$
b) $nA - I$
c) $nA - (n-2)I$
d) $nA - 2I$

33. **If A = $\begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ then for n ≥ 4; A^n =**

a) $A^{n-2} + A^3 - A$ b) $A^{n+1} + I$

c) $A^n - 2n\,A + 2I$ d) $A^{n+3} + A^n + 3I$

34. **If A = $\begin{pmatrix} 0 & 0 \\ 1 & 1 \end{pmatrix}$ then the value of $A + A^2 + A^3 + \ldots.. A^n$ = - - - - -**

a) A b) n A c) (n + 1)A d) 0

35. **If A = $[a_{ij}]_{n\times n}$ and $a_{ij} = i(i + j)$ then trace of A =**

a) $\frac{n(n+1)(2n+1)}{6}$ b) $\frac{n(n+1)(2n+1)}{3}$

c) $\frac{n(n+1)}{2}$ d) $\frac{n^2(n+1)^2}{4}$

36. **If A = $\begin{pmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & k \end{pmatrix}$ is an idempotent matrix then k =**

a) 2 b) – 2 c) 3 d) – 3

37. **If $\begin{pmatrix} 2 & 4 \\ -1 & k \end{pmatrix}$ is a nilpotent matrix of index '2' then k =**

a) 2 b) – 2 c) 3 d) – 3

38. **If $\begin{bmatrix} \lambda^2 - 2\lambda + 1 & \lambda - 2 \\ 1 - \lambda^2 + 3\lambda & 1 - \lambda^2 \end{bmatrix}$ = A λ^2 + Bλ + C where A, B, C are matrices then B + C =**

a) $\begin{bmatrix} -1 & -1 \\ 4 & 1 \end{bmatrix}$ b) $\begin{bmatrix} -1 & 1 \\ 4 & 1 \end{bmatrix}$ c) $\begin{bmatrix} 1 & 1 \\ -4 & 1 \end{bmatrix}$ d) $\begin{bmatrix} -1 & -1 \\ -4 & 1 \end{bmatrix}$

39. **If A = $\begin{bmatrix} 1 & 0 & 1 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$ then det A =**

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

40. $\begin{vmatrix} x & 1 & y+z \\ y & 1 & z+x \\ z & 1 & x+y \end{vmatrix} =$

a) 1 + x + y + z   b) x + y + z

c) 0   d) 1

41. **If x + iy =** $\begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix}$ **then**

a) x = 3, y = 1   b) x = 1, y = 3

c) x = 0, y = 3   d) x = 0, y = 0

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

a) 0   b) 1   c) abc   d) ab+bc+ca

43. **If** $x \neq 0$ **and** $\begin{vmatrix} 1 & x & 2x \\ 1 & 3x & 5x \\ 1 & 3 & 4 \end{vmatrix}$ **= 0 then x =**

a) 1   b) – 1   c) 2   d) – 2

44. **If** $\frac{1}{a} + \frac{1}{b} + \frac{1}{c}$ **= 0 then** $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} =$

a) 0   b) a b c   c) – a b c   d) 2abc

45. $\begin{vmatrix} \log e & \log e^2 & \log e^3 \\ \log e^2 & \log e^3 & \log e^4 \\ \log e^3 & \log e^4 & \log e^5 \end{vmatrix} =$

a) 0   b) 1   c) 4log e   d) 5log e

46. **If** $\begin{vmatrix} 1 & 2 & x \\ 2 & -1 & 7 \\ 2 & 4 & -6 \end{vmatrix}$ **is a singular matrix then x =**

a) 0   b) 1   c) – 3   d) 3

47. **If the matrix** $\begin{bmatrix} \cos\theta & \sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ **is singular then θ =**

a) π b) π/2 c) π/3 d) π/4

48. **The matrix** $\begin{bmatrix} 1 & 0 & 1 \\ 2 & 1 & 0 \\ 3 & 1 & 1 \end{bmatrix}$ **is**

a) Non singular b) Singular

c) Skew symmetric d) Symmetric

49. **If A =** $\begin{pmatrix} 1 & 3 \\ 2 & 1 \end{pmatrix}$**, then the determinant of** $A^2 - 2A$ **is**

a) 5 b) 25 c) – 5 d) – 25

50. $\begin{vmatrix} 1990 & 1991 & 1992 \\ 1991 & 1992 & 1993 \\ 1992 & 1993 & 1994 \end{vmatrix} =$

a) 1992 b) 1993 c) 1994 d) 0

51. **If** $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix}$ **= K(a + b + c)^2 then K =**

a) 2 b) 2(a + b + c)

c) 2abc d) $2(a + b + c)^2$

52. $\begin{vmatrix} y+z & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix}$ **=**

a) x y z b) 4xyz c) 2xyz d) 3xyz

53. **If** $\begin{vmatrix} a+b & b+c & c+a \\ b+c & c+a & a+b \\ c+a & a+b & b+c \end{vmatrix}$ **= k** $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ **then k =**

a) 8 b) 2 c) 3 d) 0

54. $\begin{vmatrix} a-b-c & 2b & 2c \\ 2a & b-c-a & 2c \\ 2a & 2b & c-a-b \end{vmatrix} =$

a) $(a + b + c)^3$ b) $2(a + b + c)^3$

c) $(a + b + c)^2$ d) $2(a + b + c)^2$

55. **If a ≠ 6, b, c satisfy** $\begin{vmatrix} a & 2b & 2c \\ 3 & b & c \\ 4 & a & b \end{vmatrix}$ **= 0 then abc =**

a) a + b + c b) 0 c) b^3 d) ab + bc

56. **If 1, w, w^2 are the cube roots of unity then**

$\Delta = \begin{vmatrix} 1 & 1+w & 1+w^2 \\ 1+w & 1+w^2 & 1 \\ 1+w^2 & 1 & 1+w \end{vmatrix} =$

a) – 2 b) 4 c) 0 d) 2

57. **If α, β, γ are the roots of $x^3 + px + q = 0$,**

then $\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix} =$

a) 0 b) p c) q d) $p^2 - 2q$

58. $\begin{vmatrix} \frac{1}{a} & a^2 & bc \\ \frac{1}{b} & b^2 & ca \\ \frac{1}{c} & c^2 & ab \end{vmatrix} =$

a) 0 b) 1

c) abc d) (a – b) (b – c) (c – a)

59. **If x + y + z = 0 and** $\begin{vmatrix} xa & yb & zc \\ yc & za & xb \\ zb & xc & ya \end{vmatrix}$ **= k** $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ **then k =**

a) x + y + z b) xy + yz + zx

c) – x y z d) $x^2 + y^2 + z^2$

60. **Let A =** $\begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$ **; If $|A^2| = 25$, then $|\alpha|$ =**

a) 5 b) 5^2 c) 1 d) 1/5

61. **If a, b, c are all different and** $\begin{vmatrix} a & a^3 & a^4-1 \\ b & b^3 & b^4-1 \\ c & c^3 & c^4-1 \end{vmatrix}$ **= 0 then abc (ab + bc + ca) =**

a) a + b + c b) 0 c) 1 d) – 1

62. **If a, b, c are positive and not all equal then** $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ **=**

a) ≤ 0 b) < 0 c) ≥ 0 d) > 0

63. $\begin{vmatrix} a^2+x & ab & ac \\ ab & b^2+x & bc \\ ac & bc & c^2+x \end{vmatrix}$ =

a) x + a + b + c
b) $(x + a^2 + b^2 + c^2)x^2$
c) $(a^2 + b^2 + c^2 + x)x$
d) (a + b + c + x)x

64. $\begin{vmatrix} -2a & a+b & a+c \\ a+b & -2b & b+c \\ a+c & b+c & -2c \end{vmatrix}$ =

a) 4(a + b)(b + c)(c + a)
b) (a – b) (b – c)(c – a)
c) 4(a + b + c)
d) 4(ab + bc + ca)

65. **If a + b + c = 0, and** $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix}$ **= 0 then x =**

a) 0
b) $\sqrt{\frac{3}{2}(a^2+b^2+c^2)}$
c) $-\sqrt{\frac{3}{2}(a^2+b^2+c^2)}$
d) $\pm\sqrt{\frac{3}{2}(a^2+b^2+c^2)}$

66. **If $a^2 + b^2 + c^2 = -2$ and $f(x) = \begin{vmatrix} 1+a^2x & (1+b^2)x & (1+c^2)x \\ (1+a^2)x & 1+b^2x & (1+c^2)x \\ (1+a^2)x & (1+b^2)x & 1+c^2x \end{vmatrix}$ then f(x) is a polynomial of degree**

a) 2 b) 3 c) 0 d) 1

67. **If $\begin{vmatrix} \lambda^2+3\lambda & \lambda-1 & \lambda+3 \\ \lambda+1 & 2-\lambda & \lambda-4 \\ \lambda-3 & \lambda+4 & 3\lambda \end{vmatrix} = P\lambda^4 + q\lambda^3 + r\lambda^2 + s\lambda + t$ then t =**

a) 16 b) 17 c) 18 d) 19

68. **If $D_r = \begin{vmatrix} r & x & \frac{n(n+1)}{2} \\ 2r-1 & y & n^2 \\ 3r-1 & z & \frac{n(3n-1)}{2} \end{vmatrix}$ then $\sum_{r=1}^{n} D_r$ =**

a) 1 b) – 1 c) 0 d) n

69. **If $\begin{vmatrix} a & b & a\alpha+b \\ b & c & b\alpha+c \\ a\alpha+b & b\alpha+c & 0 \end{vmatrix} = 0$ and α is not a root of $ax^2 - 2bx + c = 0$, then**

a) a, b, c are in A.P. b) a, b, c are in G.P.

c) a, b, c are in H.P. d) a, c, b are in A.P.

70. **If $\begin{vmatrix} x & x+y & x+y+z \\ 2x & 3x+2y & 4x+3y+2z \\ 3x & 6x+3y & 10x+6y+3z \end{vmatrix} = 64$ then x =**

a) – 1 b) 4 c) 3 d) 1

71. **If a, b, c are in A.P. then $\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix}$ =**

a) 1 b) 0 c) – 1 d) 2

72. **If l, m, n are the pth, qth, rth terms of G.P. and all positive then $\begin{vmatrix} \log l & p & 1 \\ \log m & q & 1 \\ \log n & r & 1 \end{vmatrix}$ =**

a) 3 b) 2 c) 1 d) 0

73. **If a_1, a_2, a_3 ……. a_n, …… are in G.P., then the value of** $\begin{vmatrix} \log a_n & \log a_{n+1} & \log a_{n+2} \\ \log a_{n+3} & \log a_{n+4} & \log a_{n+5} \\ \log a_{n+6} & \log a_{n+7} & \log a_{n+8} \end{vmatrix}$ **=**

a) 0 b) 1 c) – 1 d) 2

74. **If D =** $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ **for $x \neq 0$; $y \neq 0$, then D is**

a) Divisible by y but not x

b) Divisible by neither x nor y

c) Divisible by both x and y

d) Divisible by x but not y

75. **If** $\begin{vmatrix} 0 & \sin\alpha & \sin\beta \\ \sin\alpha & 0 & \sin\gamma \\ \sin\beta & \sin\gamma & 0 \end{vmatrix} = \begin{vmatrix} 1 & \sin\alpha & \sin\beta \\ \sin\alpha & 1 & \sin\gamma \\ \sin\beta & \sin\gamma & 1 \end{vmatrix}$ **then**

a) $\sin\alpha \,.\, \sin\beta \,.\, \sin\gamma = 1$ b) $\sin\alpha + \sin\beta + \sin\gamma = 1$

c) $\sin^2\alpha + \sin^2\beta + \sin^2\gamma = 1$ d) 0

76. **If f(x) =** $\begin{vmatrix} x^n & \sin x & \cos x \\ n! & \sin\frac{n\pi}{2} & \cos\frac{n\pi}{2} \\ a & a^2 & a^3 \end{vmatrix}$ **then** $\frac{d^n}{dx^n}$ **{f(x)} at x = 0 is**

a) – 1 b) 1 c) 0 d) 2

77. **If** $\begin{vmatrix} \cos(A+B) & -\sin(A+B) & \cos 2B \\ \sin A & \cos A & \sin B \\ -\cos A & \sin A & \cos B \end{vmatrix}$ **= 0 then B =**

a) $(2n+1)\frac{\pi}{2}$ b) $n\pi$ c) $(2n+1)\pi$ d) $2n\pi$

78. **If a, b, c are distinct and** $\begin{vmatrix} a & a^2 & a^3-1 \\ b & b^2 & b^3-1 \\ c & c^2 & c^3-1 \end{vmatrix}$ **= 0 then**

a) a + b + c = 1 b) ab + bc + ca = 0

c) a + b + c = 0 d) abc = 1

79. **If $a \neq p, b \neq q, c \neq r$ and** $\begin{vmatrix} p & b & c \\ p+a & q+b & 2c \\ a & b & r \end{vmatrix}$ **= 0 then**

$\frac{p}{p-a} + \frac{q}{q-b} + \frac{r}{r-c} =$

a) 3 b) 2 c) 1 d) 0

80. **If** $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}^x = \begin{vmatrix} 2bc-a^2 & c^2 & b^2 \\ c^2 & 2ac-b^2 & b^2 \\ b^2 & a^2 & 2ab-c^2 \end{vmatrix}$ **then x =**

a) 1 b) 2 c) 3 d) ½

81. $\begin{vmatrix} \log x & \log y & \log z \\ \log 2x & \log 2y & \log 2z \\ \log 3x & \log 3y & \log 3z \end{vmatrix} =$

a) 0 b) log (xyz)

c) log (6xyz) d) 6log(xyz)

82. **If** $\Delta_r = \begin{vmatrix} 2r-1 & {}^mC_r & 1 \\ m^2-1 & 2^m & m+1 \\ \sin^2(m^2) & \sin^2(m) & \sin^2(m+1) \end{vmatrix}$ **then** $\sum_{r=0}^{m} \Delta_r =$

a) 0 b) $m^2 - 1$

c) 2^m d) $2^m \sin^2(2^m)$

83. **If** $\begin{vmatrix} (a^2+b^2)/c & c & c \\ a & (b^2+c^2)/a & a \\ b & b & (c^2+a^2)/b \end{vmatrix}$ **= k abc, then k =**

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

84. $\begin{vmatrix} a^2+2a & 2a+1 & 1 \\ 2a+1 & a+2 & 1 \\ 3 & 3 & 1 \end{vmatrix} =$

a) $(a-1)^3$ b) $(a-1)^2$ c) $(a-1)^4$ d) $(a-1)$

85 **If A + B + C = π then the value of**

$$\begin{vmatrix} \sin(A+B+C) & \sin B & \cos C \\ -\sin B & 0 & \tan A \\ \cos(A+B) & -\tan A & 0 \end{vmatrix}$$ is

a) 1 b) – 1

c) sin A + sin B + sin C d) 0

86. $$\begin{vmatrix} \cos(\alpha+\beta) & -\sin(\alpha+\beta) & \cos 2\beta \\ \sin\alpha & \cos\alpha & \sin\beta \\ -\cos\alpha & \sin\alpha & \cos\beta \end{vmatrix}$$ **is independent of**

a) β b) α and β

c) α d) Neither α nor β

87. **A root of the equation** $\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix}$ **= 0 is**

a) a b) b c) 1 d) 0

88. **If** $\begin{vmatrix} 1+x & 1-x & 1-x \\ 1-x & 1+x & 1-x \\ 1-x & 1-x & 1+x \end{vmatrix}$ **= 0 then x =**

a) 0 or 3 b) 1 or 2 c) 2 d) – 1

89.If $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \begin{vmatrix} a_1 & b_1 & 1 \\ a_2 & b_2 & 1 \\ a_3 & b_3 & 1 \end{vmatrix}$ then two triangles with vectors (x_1, y_1) (x_2, y_2) (x_3, y_3) and $(a_1\ b_1)$ (a_2, b_2) (a_3, b_3) must be

a) Both right angles b) Both equilateral

c) Congruent d) Equal in area

90. **If** $\Delta_1 = \begin{vmatrix} x & b & b \\ a & x & b \\ a & a & x \end{vmatrix}$**,** $\Delta_2 = \begin{vmatrix} x & b \\ a & x \end{vmatrix}$ **then**

a) $\Delta_1 = 3\Delta_2^2$ b) $\frac{d(\Delta_1)}{dx} = 3\Delta_2$ c) $\frac{d(\Delta_1)}{dx} = 3\Delta_2^2$ d) $\Delta_1 = 3\Delta_2^{3/2}$

91. **If $D_1 = \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & k \end{vmatrix}$, $D_2 = \begin{vmatrix} a & g & x \\ b & h & y \\ c & k & z \end{vmatrix}$ and d = tx, e = ty, f = tz, then**

a) $D_1 = tD_2$ b) $tD_1 = D_2$ c) $D_1 = -tD_2$ d) $D_2 = -tD_1$

92. **If f(x) = $\begin{vmatrix} \sin^2 x & \cos^2 x & 1 \\ \cos^2 x & \sin^2 x & 1 \\ x-12 & 12 & 2 \end{vmatrix}$ then $f^1\left(\frac{\pi}{2}\right)$ =**

a) –1 b) 0 c) +1 d) ±1

93. **A factor of $\begin{vmatrix} (a-x)^2 & (b-x)^2 & (c-x)^2 \\ (a-y)^2 & (b-y)^2 & (c-y)^2 \\ (a-z)^2 & (b-z)^2 & (c-z)^2 \end{vmatrix}$ is**

a) a + b b) x – y c) b + c d) x + y

94. **Let the three digit numbers A28, 3B9, 62C where A, B, C are integers between 0 and 9 be divisible by a fixed integer K, then $\begin{vmatrix} A & 3 & 6 \\ 8 & 9 & C \\ 2 & B & 2 \end{vmatrix}$ is divisible by**

a) K^2 b) K(k + 1) c) K d) K + 2

95. **If n is a positive integer, D = $\begin{vmatrix} n! & (n+1)! & (n+2)! \\ (n+1)! & (n+2)! & (n+3)! \\ (n+2)! & (n+3)! & (n+4)! \end{vmatrix}$ then $\frac{D}{(n!)^3} - 4$ is divisible by**

a) n b) n + 1 c) n + 2 d) n + 3

96. **If f(x) = $\begin{vmatrix} 2\cos x & 1 & 0 \\ x-\pi/2 & 2\cos x & 1 \\ 0 & 1 & 2\cos x \end{vmatrix}$ then $\frac{df}{dx}$ at x = $\frac{\pi}{2}$ is**

a) 2 b) $\frac{\pi}{2}$ c) 1 d) 8

97. **The values of θ lying between θ = 0 and θ = π/2 satisfying**

$\begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & 1+\cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & \cos^2\theta & 1+4\sin 4\theta \end{vmatrix}$ = 0, are

a) $\frac{5\pi}{24}, \frac{7\pi}{24}$ b) $\frac{7\pi}{24}, \frac{11\pi}{24}$ c) $\frac{5\pi}{24}, \frac{11\pi}{24}$ d) $\frac{5\pi}{24}$

98. **Given that $b^2 - 4ac < 0$, a > 0. The value of**

$$\Delta = \begin{vmatrix} a & b & ax+by \\ b & c & bx+cy \\ ax+by & bx+cy & 0 \end{vmatrix} \text{ is}$$

a) Zero b) Positive c) Negative d) $b^2 + ac$

99. **If a, b, c are all different and** $\begin{vmatrix} 0 & x-a & x-b \\ x+a & c & x-c \\ x+b & x+c & 0 \end{vmatrix}$ **= 0 then the non zero values of x are**

a_ $\pm\sqrt{ab+bc-ca}$ b) $\pm\sqrt{ab-bc+ca}$

c) $+\sqrt{bc+ca+ab}$ d) 0

100. **Let D_r =** $\begin{vmatrix} a & 2^r & 2^{16}-1 \\ b & 3(4^r) & 2(4^{16}-1) \\ x & 7(8^r) & 4(8^{16}-1) \end{vmatrix}$ **then the value of** $\sum_{r=1}^{16} D_r$ **is**

a) 0 b) a + b + c

c) ab + bc + ca d) $a^2 + b^2 + c^2$

101. **If f(x) =** $\begin{vmatrix} 1+\sin^2 x & \cos^2 x & 4\sin 2x \\ \sin^2 x & 1+\cos^2 x & 4\sin 2x \\ \sin^2 x & \cos^2 x & 1+4\sin 2x \end{vmatrix}$**, then the maximum value of f(x) is**

a) 2 b) 4 c) 6 d) 8

102. If A = $\begin{pmatrix} 2 & 2 \\ -3 & 2 \end{pmatrix}$, B = $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ then $(B^{-1} A^{-1})^{-1}$ =

a) $\begin{pmatrix} 2 & -2 \\ 2 & 3 \end{pmatrix}$ b) $\begin{pmatrix} 3 & -2 \\ 2 & 2 \end{pmatrix}$ c) $\frac{1}{10}\begin{pmatrix} 2 & 2 \\ -2 & 3 \end{pmatrix}$ d) $\frac{1}{10}\begin{pmatrix} 3 & 2 \\ -2 & 2 \end{pmatrix}$

103. If Adj $\begin{bmatrix} 1 & 0 & 2 \\ -1 & 1 & -2 \\ 0 & 2 & 1 \end{bmatrix} = \begin{bmatrix} 5 & a & -2 \\ 1 & 1 & 0 \\ 2 & -2 & b \end{bmatrix}$ then [a, b] =

a) [–4, 1] b) [–4, –1] c) [4, 1] d) [4, –1]

104. **If A =** $\begin{pmatrix} \cos x & \sin x & 0 \\ -\sin x & \cos x & 0 \\ 0 & 0 & 1 \end{pmatrix}$ **= f(x) then** A^{-1} **=**

a) f(–x) b) f(x) c) –f(x0 d) –f(–x)

105. **The inverse of** $\begin{bmatrix} 3 & 5 & 7 \\ 2 & -3 & 1 \\ 1 & 1 & 2 \end{bmatrix}$ **is**

a) $\begin{bmatrix} 3 & 5 & -7 \\ 2 & 3 & 76 \\ 2 & 2 & 0 \end{bmatrix}$ b) $\begin{bmatrix} 3 & 2 & 1 \\ 5 & -3 & 10 \\ 7 & 21 & 0 \end{bmatrix}$ c) $\begin{bmatrix} 7 & 3 & -26 \\ 3 & 1 & -11 \\ -5 & -2 & 19 \end{bmatrix}$ d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

106. **If A is an invertible matrix of order 'n' then the determinant of adj A =**

a) $|A|^n$ b) $|A|^{n+1}$ c) $|A|^{n-1}$ d) $|A|^{n+2}$

107. **If A is a** 3×3 **matrix and |Adj A| = 16 then |A| =**

a) +4 b) –4 c) ±4 d) 8

108. **If** $\begin{bmatrix} 0 & 1 & a \\ 1 & a & 0 \\ a & 0 & 1 \end{bmatrix}$ **is invertible then a ≠**

a) 0 b)1 c) –1 d) 2

109. **If A =** $\begin{bmatrix} a+ib & c+id \\ -c+id & a-ib \end{bmatrix}$**,** $a^2 + b^2 + c^2 + d^2 = 1$ **the inverse of A is**

a) $\begin{bmatrix} a-ib & -c-id \\ c-id & a+ib \end{bmatrix}$ b) $\begin{bmatrix} a+ib & c+id \\ c+id & a-ib \end{bmatrix}$

c) $\begin{bmatrix} a-ib & c-id \\ c-id & a+ib \end{bmatrix}$ d) $\begin{bmatrix} a+ib & -c-id \\ c-id & a+ib \end{bmatrix}$

110. $\begin{bmatrix} 1 & -\tan\frac{\theta}{2} \\ \tan\frac{\theta}{2} & 1 \end{bmatrix} \begin{bmatrix} 1 & \tan\frac{\theta}{2} \\ -\tan\frac{\theta}{2} & 1 \end{bmatrix}^{-1} =$

a) $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ b) $\begin{bmatrix} -\cos\theta & \sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ c) $\begin{bmatrix} \sin\theta & -\cos\theta \\ \cos\theta & \sin\theta \end{bmatrix}$ d) $\begin{bmatrix} -\sin\theta & \cos\theta \\ \cos\theta & -\sin\theta \end{bmatrix}$

111. **Let A =** $\begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$**. The only correct statement about the matrix A is**

a) A is a zero matrix b) $A^2 = I$

c) A^{-1} does not exist d) A = (–1)I, where I is a unit matrix

112. **Let A =** $\begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ **and (10)B =** $\begin{bmatrix} 4 & 2 & 2 \\ -5 & 1 & \alpha \\ 1 & -2 & 3 \end{bmatrix}$**. If B is the inverse of matrix A, then** α is

a) – 2 b) 5 c) 2 d) – 1

113. If A = $\begin{bmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then $(\text{Adj } A)^{-1}$ =

a) I b) A c) 1 d) 0

114. **If 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** $[F(x)\,G(x)]^{-1}$

a) G(x) F(–x) b) $\{F(x)\}^{-1}\{G(x)\}^{-1}$

c) [G(x)] [F(x)] d) F(x) . G(x)

115. **If A =** $\begin{bmatrix} -1 & 2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ **and Adj A =** xA^T **then x =**

a) 2 b) 3 c) – 3 d) – 2

116. **If A is square matrix such that A(Adj A) =** $\begin{pmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{pmatrix}$ **then det (Adj A) =**

a) 4 b) 16 c) 64 d) 256

117. **Let A =** $\begin{bmatrix} -1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{bmatrix}$ **then |Adj (Adj A)| =**

a) 64 b) 256 c) 8 d) 6

118. **If A is non singular and $A^2 - 5A + 7I = 0$ then I =**

a) $\frac{1}{7}A - \frac{5}{7}A^{-1}$　　b) $\frac{1}{7}A + \frac{5}{7}A^{-1}$

c) $\frac{1}{5}A + \frac{7}{5}A^{-1}$　　d) $\frac{1}{5}A - \frac{7}{5}A^{-1}$

119. If A is non singular and $(A - 2I)(A - 4I) = 0$ then $\frac{1}{6}A + \frac{4}{3}A^{-1} =$

a) I　　b) 0　　c) 2I　　d) 6I

120. **A square non singular matrix A satisfies $A^2 - A + 2I = 0$, then $A^{-1} =$**

a) I – A　　b) $\frac{1}{2}(I - A)$　　c) I + A　　d) $\frac{1}{2}(I + A)$

121. **If $A \neq A^2 = I$ then $|I + A| =$**

a) 1　　b) – 1　　c) 0　　d) 2

122. **If A is a 3×3 matrix and B is its Adjoint matrix. If the determinant of B is 64 then the determinant of A is**

a) ±6　　b) ±8　　c) ±4　　d) ±16

123. **If $A \neq I$ is an idempotent matrix then A is**

a) Singular matrix　　b) Non singular matrix

c) Symmetric　　d) Skew symmetric matrix

124. **If A is an orthogonal matrix, the |A| is**

a) 1　　b) – 1　　c) ±1　　d) 0

125. **If A and B are two square matrices such that**

$B = -A^{-1}BA$, then $(A + B)^2 =$

a) 0　　b) $A^2 + B^2$

c) $A^2 + 2AB + B^2$　　d) A + B

126. **Let A and B be square matrices of 3rd order and A be an orthogonal matrix and B is a skew symmetric matrix. Then which of the following is not true.**

a) Numerical value of |A| is 1 b) |B| = 0

c) |AB| = 1 d) |AB| = 0

127. **Which of the following statements is false**

a) If |A| = 0, then |adj A| = 0

b) Adjoint of a diagonal matrix of order 3×3 is a diagonal matrix.

c) Product of two upper triangular matrices is an upper triangular matrix.

d) Adj (AB) = adj (A) adj (B)

128. **If for a matrix A, $A^2 + I = 0$ where I is the identity matrix then A =**

a) $\begin{bmatrix} -i & 0 \\ 0 & -i \end{bmatrix}$ b) $\begin{bmatrix} -i & 0 \\ 0 & i \end{bmatrix}$

c) $\begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}$ d) all the above

129. **If $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$ A $\begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix}$ = $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then the matrix A is**

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

130. **If A = $\begin{bmatrix} a & b \\ 0 & c \end{bmatrix}$ then A^{-1} + (A – aI) (A – cI) =**

a) $\frac{1}{ac}\begin{bmatrix} a & b \\ 0 & -c \end{bmatrix}$ b) $\frac{1}{ac}\begin{bmatrix} -a & b \\ 0 & c \end{bmatrix}$ c) $\frac{1}{ac}\begin{bmatrix} c & -b \\ 0 & a \end{bmatrix}$ d) $\frac{1}{ac}\begin{bmatrix} c & b \\ 0 & -a \end{bmatrix}$

131. **If S = $\begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$, A = $\frac{1}{2}\begin{bmatrix} b+c & c-a & b-a \\ c-b & c+a & a-b \\ b-c & a-c & a+b \end{bmatrix}$, then SAS^{-1} =**

a) $\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$ b) $\frac{1}{2}\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$ c) $2\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$ d) $3\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$

132. **If A is a square matrix of order 3 then** $|Adj(Adj\,A^2)|$ **=**

a) $|A|^2$ b) $|A|^4$ c) $|A|^8$ d) $|A|^{16}$

133. **Let P and Q be two 2 × 2 matrices. Consider the statements**

(i) $PQ = 0 \Rightarrow P = 0$ or $Q = 0$ or both

(ii) $PQ = I_2 \Rightarrow P = Q^{-1}$

(iii) $(P + Q)^2 = P^2 + 2PQ + Q^2$.

a) (i) and (ii) are false (iii) is true

b) (i) and (iii) are false (ii) is true

c) All are false

d) All are true

134. **If the inverse of the matrix** $\begin{bmatrix} 1 & 0 & 2 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$ **is** $\frac{1}{3}\begin{bmatrix} 1 & b & d \\ -2 & c & 4 \\ a & -2 & 1 \end{bmatrix}$ **then the ascending order of a, b, c, d is**

a) a, b, c, d b) b, c, a, d c) c, d, a, b d) b, a, c, d

135. **If A is any square matrix of order 'n'.**

Observe the following list

List – I	**List – II**
A) |adj A|	**1)** $|A|^{n-2}A$
B) adj (adj A)	**2)** $|A|^{n(n-1)}$
C))adj A)$^{-1}$	**3)** $|A|^{(n-1)^2}$
D) |adj(adj A)|	**4)** $|A|^{n-1}$
	5) $\frac{1}{|A|}$ **. A**

a) A – 4; ;B – 5; C – 1; D – 3

b) A – 4; B – 5; C – 1; D – 2

c) A – 4; B – 1; C – 5; D – 2

d) A – 4; B – 1; C – 5; D – 3

136. **Match the following from List – I to List – II**

List – I	List – II
A) If A = $\begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & 2 & 1 \end{bmatrix}$ then A^{-1} =	1) A^T
B) If A = $\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$ then A^{-1} =	2) A^3
C) IF A = $\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ then A^{-1}	3) $\frac{A^T}{9}$

a) A – 1; B – 2; C – 3   b) A – 2; B – 3; C – 1

c) A – 3; B – 1; C – 2   d) A – 3; B – 2; C – 1

137. **Assertion (A)**: If A is a 3×3 matrix and det A = 5 then det adj A = 25.

Reason (R): If A is a square matrix of type n then det adj A = $(\det A)^{n-1}$.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true and R is not correct explanation of A

c) A is true but R is false

d) A is false but R is true

138. **Assertion (A)**: If A is a non singular matrix and B is a matrix then det $(A^{-1}BA)$ = det B.

Reason (R): If A is a square matrix, then $Adj(A^T) – (Adj\ A)^T$ is a unit matrix.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true and R is not correct explanation of A

c) A is true but R is false

d) A is false but R is true

139. **The number of non trivial solutions of the system x – y + z = 0, x + 2y – z = 0, 2x + y + 3z = 0 is**

a) 0   b) 1   c) 2   d) 3

140. **The number of solutions of the system of equations $2x + y - z = 7$, $x - 3y + 2z = 1$, $x + 4y - 3z = 5$ is**

a) 3 b) 2 c) 1 d) 0

141. **The equations $x + y + z = 0$, $2x - y - 3z = 0$, $3x - 5y + 4z = 0$ have**

a) Unique solution b) Infinitely many solutions

c) No solution d) None

142. **The equations $x + 2y + 3z = 1$, $2x + y + 3z = 2$, $5x + 5y + 9z = 4$ have**

a) No solution b) One solution

c) Infinitely many solutions d) None

143. **The equations $x - y + 2z = 4$, $3x + y + 4z = 6$, $x + y + z = 1$ have**

a) No solution b) One solution

c) Infinitely many solutions d) None

144. **The equations $x + 4y - 2z = 3$, $3x + y + 5z = 7$, $2x + 3y + z = 5$ have**

a) Unique solution b) No solution

c) Infinitely many solutions d) None

145. **If the system of equations $2x + 3ky + (3x + 4)z = 0$, $x + (k + 4)y + (4k + 2)z = 0$, $x + 2(k + 4)y + (3k + 4)z = 0$ has non trivial solution then K =**

a) -8 or ½ b) -8, $-1/2$ c) -4 or ½ d) 4 or $-1/2$

146. **The system of equations $3x - 2y + z = 0$, $\lambda x - 14y + 15z = 0$, $x + 2y - 3z = 0$ has non zero solution then λ =**

a) 1 b) 3 c) 5 d) 0

147. **If $x^2 + y^2 + z^2 \neq 0$, $x = cy + bz$, $y = ax + cx$ and $z = bx + ay$ then $a^2 + b^2 + c^2 + 2abc =$**

a) 0 b) 1 c) 2 d) – 1

148. **The system of equations $x + y + z = 6$, $x + 2y + \lambda z = 0$, $x + 2y + 3z = 10$ has no solution then $\lambda =$**

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

149. **The rank of $\begin{bmatrix} 1 & -1 & 1 \\ 1 & 1 & -1 \\ -1 & 1 & 1 \end{bmatrix}$ is**

a) 0 b) 1 c) 2 d) 3

150. **The rank of the matrix $A = \begin{bmatrix} 1 & 4 & -1 \\ 2 & 3 & 0 \\ 0 & 1 & 2 \end{bmatrix}$ is**

a) 3 b) 2 c) 1 d) 0

151. **The rank of $\begin{bmatrix} 1 & 0 & -4 \\ 2 & -1 & 3 \end{bmatrix}$ is**

a) 1 b) 2 c) 0 d) 3

152. **If I_n is the identity matrix of order n then the rank of I_n is**

a) 1 b) n + 1 c) n d) n – 1

153. **If $A = [a_{ij}]_{m \times n}$ is a matrix of ran r then**

a) $r = \min(m, n)$ b) $r < \min(m, n)$

c) $r \leq \min(m, n)$ d) None

154. **If the system of linear equations $x + 2ay + az = 0$, $x + 3by + bz = 0$, $x + 4cy + cz = 0$ has a non zero solution, then a, b, c**

a) Are in G.P. b) Are in H.P.

c) Satisfy $a + 2b + 3c = 0$ d) Are in A.P.

155. **The system of equations $\alpha x + y + z = \alpha - 1$, $x + \alpha y + z = \alpha - 1$, $x + y + \alpha z = \alpha - 1$ has no solution, if α is**

a) 1 b) Not – 2

c) Either – 2 or 1 d) – 2

156. **If the system of equations $ax + y + z = 0$, $x + by + z = 0$, $x + y + cz = 0$ ($a, b, c \neq 1$) has a non trivial solution then $\frac{1}{1-a} + \frac{1}{1-b} + \frac{1}{1-c} =$**

a) 1 b) – 1 c) 2 d) – 2

157. **The system of equations $x - cy - bz = 0$, $y - ax - cx = 0$, $z - bx - ay = 0$ has a non trivial solution then $a^2 + b^2 + c^2 + 2abc =$**

a) 0 b) – 1 c) 2 d) 1

158. **The equations $x + y + z = 6$, $x + 2y + 3z = 10$, $x + 2y + \lambda z = \mu$ have unique solution if**

a) $\lambda = 3, \mu = 10$ b) $\lambda = 3, \mu \neq 10$

c) $\lambda \neq 3$ d) None

159. **If the system of equations $x + 2y + 3z = \lambda x$, $3x + y + 2z = \lambda y$, $2x + 3y + z = \lambda z$ has non trivial solution then $\lambda =$**

a) 6 b) 12 c) 18 d) 16

160. **By eliminating a, b, c from the homogeneous equations $x = \frac{a}{b-c}$, $y = \frac{b}{c-a}$, $z = \frac{c}{a-b}$ where a, b, c not all zero then $xy + yz + zx =$**

a) 1 b) – 1 c) 2 d) 0

161. **The system of equations $x + y + z = 6$, $x + 2y + 3z = 10$, $z + 2y + \lambda z = k$ is inconsistent if $\lambda = \ldots.$, $k \neq \ldots.$**

a) 3, 7 b) 3, 10 c) 7, 10 d) 10, 3

162. **The rank of** $\begin{bmatrix} 1 & -1 & 1 & 1 \\ -1 & 1 & 1 & 2 \\ 1 & 1 & -1 & 3 \end{bmatrix}$ **is**

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

163. **The system of equations – 2x + y + z = a, x – 2y + z = b, x + y – 2z = c is inconsistent if**

a) a + b + c = 0 b) a + b + c = 1

c) a + b + c ≠ 0 d) a + b + c ≥ 0

164. **The rank of the matrix** $\begin{bmatrix} -1 & 2 & 5 \\ 2 & -4 & a-4 \\ 1 & -2 & a+1 \end{bmatrix}$ **is**

a) 3 if a = 6 b) 1 if a = –6

c) 3 if a = 2 d) 2 if a = –6

165. **If a + b + c ≠ 0, the system of equations (b + c) (y + z) – ax = b – c, (c + a) (z + x) – by = c – a, (a + b) (x + y) – cz = a – b have**

a) A unique solution b) No solution

c) Infinite number of solutions d) None

166. **If the system of linear equations (sin 3θ)x – y + z = 0, (cos 2θ)x + 4y + 3z = 0. 2x + 7y + 7z = 0 has a non trivial solution then the values of θ are**

a) $n\pi, n\pi + (-1)^n \pi/3$ b) $n\pi, n\pi + (-1)^n \pi/6$

c) $n\pi, n\pi + (-1)^n \pi/2$ d) $n\pi, n\pi + (-1)^n \pi/4$

167. **Let λ and α be real. The set of all values of λ for which the system of linear equations**

λx + (sin α)y + (cos α)z = 0; x + (cos α)y + (sin α)z = 0; –x + (sin α)y – (cos α)z = 0 has a non trivial solution is

a) $[0, \sqrt{2}]$ b) $[-\sqrt{2}, 0]$ c) $[-\sqrt{2}, \sqrt{2}]$ d) $[0, -\sqrt{2}]$

MATRICES

ANSWERS

1.	c	26.	a	51.	b
2.	c	27.	c	52.	b
3.	b	28.	b	53.	b
4.	d	29.	a	54.	a
5.	b	30.	a	55.	c
6.	b	31.	d.	56.	a
7.	b	32.	d	57.	a
8.	c	33.	a	58.	a
9.	d	34.	b	59.	c
10.	a	35.	b	60.	d
11.	c	36.	d	61.	a
12.	a	37.	b	62.	b
13.	a	38.	b	63.	b
14.	c	39.	a	64.	a
15.	a	40.	c	65.	d
16.	c	41.	d	66.	a
17.	c	42.	a	67.	c
18.	c	43.	b	68.	c
19.	a	44.	b	69.	b
20.	b	45.	a	70.	b
21.	b	46.	c	71.	b
22.	b	47.	d	72.	d
23.	b	48.	b	73.	a
24.	a	49.	b	74.	c
25.	b	50.	d	75.	c

76.	c	104.	a	132.	c
77.	a	105.	c	133.	b
78.	d	106.	c	134.	c
79.	b	107.	c	135.	c
80.	b	108.	c	136.	c
81.	a	109.	a	137.	a
82.	a	110.	a	138.	c
83.	a	111.	b	139.	a
84.	a	112.	b	140.	d
85.	d	113.	b	141.	a
86.	c	114.	a	142.	b
87.	d	115.	b	143.	c
88.	c	116.	b	144.	b
89.	d	117.	b	145.	a
90.	b	118.	c	146.	c
91.	c	119.	a	147.	b
92.	a	120.	b	148.	b
93.	b	121.	c	149.	d
94.	c	122.	b	150.	a
95.	a	123.	a	151.	b
96.	a	124.	c	152.	c
97.	b	125.	b	153.	c
98.	c	126.	c	154.	b
99.	a	127.	d	155.	d
100.	a	128.	d	156.	a
101.	c	129.	a	157.	d
102.	a	130.	c	158.	c
103.	c	131.	a	159.	a

160.	b
161.	b
162.	b
163.	c
164.	b
165.	a
166.	b
167.	c