EXERCISE – I SINGLE CORRECT (OBJECTIVE QUESTIONS)

1. The number of different orders of a matrix having 12 elements is
(A) 3 (B) 1 (C) 6 (D) None of these

2. $\begin{bmatrix} x^2+x & x \\ 3 & 2 \end{bmatrix} + \begin{bmatrix} 0 & -1 \\ -x+1 & x \end{bmatrix} = \begin{bmatrix} 0 & -2 \\ 5 & 1 \end{bmatrix}$ then x is equal to
(A) –1 (B) 2 (C) 1 (D) No value of x

3. If A = $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ and B = $\begin{bmatrix} -5 & 4 & 0 \\ 0 & 2 & -1 \\ 1 & -3 & 2 \end{bmatrix}$, then
(A) AB = $\begin{bmatrix} -5 & 8 & 0 \\ 0 & 4 & -2 \\ 3 & -9 & 6 \end{bmatrix}$ (B) AB = $[-2\ \ -1\ \ 4]$
(C) AB = $\begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix}$ (D) AB does not exist

4. If $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, $J = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then B equal to
(A) $I\cos\theta + J\sin\theta$ (B) $I\cos\theta - J\sin\theta$
(C) $I\sin\theta + J\cos\theta$ (D) $-I\cos\theta + J\sin\theta$

5. If A and B are square matrices of order 2, then $(A + B)^2$ equal to
(A) $A^2 + 2AB + B^2$ (B) $A^2 + AB + BA + B^2$
(C) $A^2 + 2BA + B^2$ (D) None of these

6. If A is a skew – symmetric matrix, then trace of A is equal to
(A) 1 (B) –1 (C) 0 (D) None of these

7. If A = $\begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$, then adj A equal to
(A) $\begin{bmatrix} 1 & -2 \\ -2 & 1 \end{bmatrix}$ (B) $\begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & -2 \\ -2 & -1 \end{bmatrix}$ (D) $\begin{bmatrix} -1 & 2 \\ 2 & -1 \end{bmatrix}$

8. If A = $\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then adj A equal to
(A) A' (B) I (C) O (D) A^2

9. If A is a square matrix such that $A^2 = I$, then A^{-1} equal to
(A) 2A (B) A (C) O (D) A + I

10. If A and B are square matrices of order 3 such that |A| = –1, |B| = 3, then |3AB| is equal to
(A) –9 (B) –81 (C) –27 (D) 81

11. If A = $\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$, then value of A^{-1} is equal to
(A) A (B) A^2 (C) A^3 (D) A^4

12. Let A = $\begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$ and $\begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$ and X be a matrix such that A = BX is equal to
(A) $\frac{1}{2}\begin{bmatrix} 2 & 4 \\ 3 & -5 \end{bmatrix}$ (B) $\frac{1}{2}\begin{bmatrix} -2 & 4 \\ 3 & 5 \end{bmatrix}$
(C) $\begin{bmatrix} 2 & 4 \\ 3 & -5 \end{bmatrix}$ (D) None of these

13. If B is a non–singular matrix and A is a square matrix, then det $(B^{-1}AB)$ is equal to
(A) det (A^{-1}) (B) det (B^{-1}) (C) det (A) (D) det (B)

14. The system of equation –2x + y + z = 1, x – 2y + z = –2, x + y + λz = 4 will have no solution if
(A) λ = –2 (B) λ = –1 (C) λ = 3 (D) none of these

15. The system of the linear equations x + y – z = 6, x + 2y – 3z = 14 and 2x + 5y – λz = 9 (λ ∈ R) has a unique solution if
(A) λ = 8 (B) λ ≠ 8 (C) λ = 7 (D) λ ≠ 7

16. If the system of equations x + 2y + 3z = 4, x + λy + 2z = 3, x + 4y + μz = 3 has an infinite a number of solutions then
(A) λ = 2, μ = 3 (B) λ = 2, μ = 4
(C) 3λ = 2 μ (D) None of these

17. The matrix A = $\begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}$ is
(A) idempotent matrix (B) involutory matrix
(C) nilpotent matrix (D) None of these

18. If A = diag (2, –1, 3), B = diag (–1, 3, 2), then A^2 B equal to
(A) diag (5, 4, 11) (B) diag (–4, 3, 18)
(C) diag (3, 1, 8) (D) B

19. $A = \begin{bmatrix} 2 & -1 \\ -7 & 4 \end{bmatrix}$ & $B = \begin{bmatrix} 4 & 1 \\ 7 & 2 \end{bmatrix}$ then $B^T A^T$ is
(A) a null matrix (B) an identity matrix
(C) scalar, but not an identity matrix
(D) such that $T_r (B^T A^T) = 4$

20. If the matrix AB is a zero matrix, then
(A) A = O or B = O (B) A = O and B = O
(C) It is not necessary that either A = O or B = O
(D) All the above statements are wrong

21. Which relation true for $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 4 \\ -1 & 1 \end{bmatrix}$
(A) $(A + B)^2 = A^2 + 2AB + B^2$
(B) $(A - B)^2 = A^2 - 2AB + B^2$
(C) AB = BA (D) None of these

22. If AB = A and BA = B, then B^2 is equal to
(A) B (B) A (C) I (D) 0

23. If A and B are symmetric matrices, then ABA is
(A) symmetric matrix (B) skew–symmetric
(C) a diagonal matrix (D) scalar matrix

24. If A is a skew – symmetric matrix and n is an even positive integer, then A^n is
(A) a symmetric matrix (B) a skew–symmetric matrix
(C) a diagonal matrix (D) None of these

25. If A is a non–singular matrix and A^T denotes the transpose of A, then
(A) $|A| \neq |A^T|$ (B) $|A \cdot A^T| \neq |A|^2$
(C) $|A^T \cdot A| \neq |A^T|^2$ (D) $|A| + |A^T| \neq 0$

26. Which of the following is incorrect
(A) $A^2 - B^2 = (A + B)(A - B)$ (B) $(A^T)^T = A$
(C) $(AB)^n = A^nB^n$, where A, B commute
(D) $(A - I)(I + A) = O \Leftrightarrow A^2 = I$

27. If A is square matrix of order 3, then the true statement is (where I is unit matrix).
(A) det (–A) = –det A (B) det A = 0
(C) det (A + I) = 1 + det A (D) det 2A = 2 det A

28. If a, b, c are non zeros, then the system of equations $(\alpha + a)x + \alpha y + \alpha z = 0$
$\alpha x + (\alpha + b)y + \alpha z = 0$
$\alpha x + \alpha y + (\alpha + c)z = 0$
has a non–trivial solution if
(A) $\alpha^{-1} = -(a^{-1} + b^{-1} + c^{-1})$ (B) $a^{-1} = a + b + c$
(C) $\alpha + a + b + c = 1$ (D) None of these

29. Given $A = \begin{bmatrix} 1 & 3 \\ 2 & 2 \end{bmatrix}$; $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$. If $A - \lambda I$ is a singular matrix then
(A) $\lambda \in \phi$ (B) $\lambda^2 - 3\lambda - 4 = 0$
(C) $\lambda^2 + 3\lambda + 4 = 0$ (D) $\lambda^2 - 3\lambda - 6 = 0$

30. From the matrix equation AB = AC, we conclude B = C provided
(A) A is singular (B) A is non–singular
(C) A is symmetric (D) A is a square

31. Let $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ and $10B = \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{bmatrix}$. If B is the inverse of matrix A, then α is
(A) –2 (B) –1 (C) 2 (D) 5

32. The value of 'k' for which the set of equations 3x + ky – 2z = 0, x + ky + 3z = 0, 2x + 3y – 4z = 0 has a non – trivial solution over the set of rational is
(A) 33/2 (B) 31/2 (C) 16 (D) 15

33. The value of a for which system of equations,
$a^3x + (a + 1)^3 y + (a + 2)^3 z = 0$,
$ax + (a + 1)y + (a + 2)z = 0$,
$x + y + z = 0$, has a non–zero solution is
(A) –1 (B) 0 (C) 1 (D) None of these

34. If $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ satisfies the equation $x^2 - (a + d)x + k = 0$, then
(A) k = bc (B) k = ad
(C) $k = a^2 + b^2 + c^2 + d^2$ (D) ad – bc

35. Which of the following is a nilpotent matrix
(A) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (B) $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ (C) $\begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$

36. The system of equations 2x + y = 4, 3x + 2y = 2, x + y = 2 have
(A) no solution (B) one solution
(C) two solutions (D) infinitely many solutions

37. Let A be a square matrix. Then which of the following is not a symmetric matrix
(A) A + A′ (B) A′A (C) AA′ (D) A – A′

38. If $[1 \ x \ 1] \begin{bmatrix} 1 & 3 & 2 \\ 0 & 5 & 1 \\ 0 & 3 & 2 \end{bmatrix} \begin{bmatrix} x \\ 1 \\ -2 \end{bmatrix} = [0]$ then x is
(A) $-\frac{1}{2}$ (B) $\frac{1}{2}$ (C) 1 (D) –1

39. If A and B are two matrices such that AB = B and BA = A, then $A^2 + B^2$ equal to
(A) 2 AB (B) 2BA (C) A + B (D) AB

40. If $A=\begin{bmatrix}1 & -1\\ 2 & 1\end{bmatrix}$, $B=\begin{bmatrix}a & 1\\ b & -1\end{bmatrix}$ and $(A+B)^2 = A^2+B^2+2AB$, then the values of a and b are
(A) a = 1, b = –2 (B) a = 1, b = 2
(C) a = –1, b = 2 (D) a = –1, b = –2

41. If $A = \begin{bmatrix}3 & 1 & -1\\ 0 & 1 & 2\end{bmatrix}$, then AA′ is
(A) symmetric matrix (B) skew–symmetric matrix
(C) orthogonal matrix 0 (D) none of these

42. The system of equations
x + y + z = 8, x – y + 2z = 6, 3x + 5y – 7z = 14 has
(A) a unique solution
(B) infinite number of solutions
(C) no solution (D) None of these

43. If ω is a cube root of unity and $A = \begin{bmatrix}1 & 1 & 1\\ 1 & \omega & \omega^2\\ 1 & \omega^2 & \omega\end{bmatrix}$, then A^{-1} equal to
(A) $\begin{bmatrix}1 & \omega & \omega^2\\ \omega^2 & 1 & \omega\\ \omega & \omega^2 & 1\end{bmatrix}$ (B) $\frac{1}{3}\begin{bmatrix}1 & 1 & 1\\ 1 & \omega^2 & \omega\\ 1 & \omega & \omega^2\end{bmatrix}$
(C) $\begin{bmatrix}1 & \omega & \omega^2\\ 1 & \omega^2 & \omega\\ 1 & 1 & 1\end{bmatrix}$ (D) $\frac{1}{2}\begin{bmatrix}1 & \omega & \omega^2\\ 1 & \omega^2 & \omega\\ 1 & 1 & 1\end{bmatrix}$

44. Let $A = \begin{bmatrix}x+\lambda & x & x\\ x & x+\lambda & x\\ x & x & x+\lambda\end{bmatrix}$, then A^{-1} exists if
(A) $x \neq 0$ (B) $\lambda \neq 0$
(C) $3x + \lambda \neq 0, \lambda \neq 0$ (D) $x \neq 0, \lambda = 0$

45. Let $A=\begin{bmatrix}1 & \sin\theta & 1\\ -\sin\theta & 1 & \sin\theta\\ -1 & -\sin\theta & 1\end{bmatrix}$ where $0 \le \theta < 2\pi$, then
(A) Det (A) = 0 (B) Det A $\in (0, \infty)$
(C) Det (A) $\in [2, 4]$ (D) Det A $\in [2, \infty)$

46. If $A = \begin{bmatrix}0 & 1 & 2\\ 1 & 2 & 3\\ 3 & a & 1\end{bmatrix}$, $A^{-1} = \begin{bmatrix}1/2 & -1/2 & 1/2\\ -4 & 3 & c\\ 5/2 & -3/2 & 1/2\end{bmatrix}$, then
(A) a = 1, c = –1 (B) a = 2, c = $-\frac{1}{2}$
(C) a = –1, c = 1 (D) a = $\frac{1}{2}$, c = $\frac{1}{2}$

47. If A and B are two square matrices such that $B = -A^{-1}BA$, then $(A + B)^2$ equal to
(A) 0 (B) $A^2 + B^2$ (C) $A^2 + 2AB + B^2$ (D) A + B

48. Let $A = \begin{bmatrix}5 & 5\alpha & \alpha\\ 0 & \alpha & 5\alpha\\ 0 & 0 & 5\end{bmatrix}$ If $|A^2| = 25$, then $|\alpha|$ equals
(A) 5^2 (B) 1 (C) 1/5 (D) 5

49. If A and B are square matrices of size n × n such that $A^2 - B^2 = (A - B)(A + B)$, then which of the following will be always true ?
(A) AB = BA (B) either of A or B is a zero matrix
(C) either of A or B is an identity matrix (D) A = B

50. If $A^2 - A + I = 0$, then the inverse of A is
(A) I – A (B) A – I (C) A (D) A + I

51. If $A = \begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}$ and $I = \begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$, then which one of the following holds for all $n \ge 1$, by the principle of mathematical induction ?
(A) $A^n = 2^{n-1}A + (n-1)I$ (B) $A^n = nA + (n-1)I$
(C) $A^n = 2^{n-1}A - (n-1)I$ (D) $A^n = nA - (n-1)I$

52. 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

53. 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 = (–1)I, where I is a unit matrix
(C) A^{-1} does not exist (D) $A^2 = I$

54. If $A = \begin{bmatrix}a & b\\ b & a\end{bmatrix}$ and $A^2 = \begin{bmatrix}\alpha & \beta\\ \beta & \alpha\end{bmatrix}$ then
(A) $\alpha = a^2 + b^2, \beta = ab$ (B) $\alpha = a^2 + b^2, \beta = 2ab$
(C) $\alpha = a^2 + b^2, \beta = a^2 - b^2$ (D) $\alpha = 2ab, \beta = a^2 + b^2$

55. If A = $\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$. I is the unit matrix of order 2 and a, b are arbitrary constants, then $(aI + bA)^2$ is equal to

(A) $a^2I + b^2A$ (B) $a^2I = abA$
(C) $a^2I + 2abA$ (D) None of these

56. If A = $\begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$, then A

(A) nilpotent (B) involutary
(C) idempotent (D) scalar

57. If A is singular matrix of order n, then A(adj A) equals

(A) null matrix (B) row matrix
(C) identity matrix (D) None of these

58. A and B be 3 × 3 matrices. Then AB = 0 implies

(A) A = 0 and B = 0 (B) |A| = 0 and |B| = 0
(C) either |A| or |B| = 0 (D) A = 0 or B = 0

59. Which one of the following is wrong ?

(A) The elements on the main diagonal of a symmetric matrix are all zero
(B) The elements on the main diagonal of a skew – symmetric matrix are all zero
(C) For any square matrix A, 1/2 (A + A′) is symmetric
(D) For any square matrix, 1/2 (A – A′) is skew – symmetric

60. Which of the following statements is incorrect for a square matrix A. ($|A| \neq 0$)

(A) If A is a diagonal matrix, A^{-1} will also be a diagonal matrix
(B) If A is symmetric matrix, A^{-1} will also be a symmetric matrix
(C) If $A^{-1} = A \Rightarrow$ A is an idempotent matrix
(D) If $A^{-1} = A \Rightarrow$ A is an involutary matrix

61. Identity the correct statement(s)

(A) If system of n simultaneous linear equations has a unique solution, then coefficient matrix is singular
(B) If system of n simultaneous linear equations has a unique solution, then coefficient matrix is non–singular
(C) If A^{-1} exists, $(\text{adj } A)^{-1}$ may or may not exist
(D) $F(x)=\begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 0 \end{bmatrix}$, then F(x) . F(y) = F(x – y)

62. Let D = $\begin{vmatrix} \sin\theta\cos\phi & \sin\theta\sin\phi & \cos\theta \\ \cos\theta\cos\phi & \cos\theta\sin\phi & -\sin\theta \\ -\sin\theta\sin\phi & \sin\theta\cos\phi & 0 \end{vmatrix}$, then

(A) Δ is independent of θ (B) Δ is independent of ϕ
(C) Δ is a constant (D) None of these

63. The absolute value of the determinant $\begin{vmatrix} -1 & 2 & 1 \\ 3+2\sqrt{2} & 2+2\sqrt{2} & 1 \\ 3-2\sqrt{2} & 2-2\sqrt{2} & 1 \end{vmatrix}$ is

(A) $16\sqrt{2}$ (B) $8\sqrt{2}$ (C) 0 (D) None of these

64. If α, β & γ are the roots of the equation $x^3 + px + q = 0$ then the value of the determinant $\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix}$ equal to

(A) p (B) q (C) $p^2 - 2q$ (D) None of these

65. If a, b, c > 0 & x, y, z $\in$ R then the determinant $\begin{vmatrix} (a^x+a^{-x})^2 & (a^x-a^{-x})^2 & 1 \\ (b^y+b^{-y})^2 & (b^y-b^{-y})^2 & 1 \\ (c^z+c^{-z})^2 & (c^z-c^{-z})^2 & 1 \end{vmatrix}$ equal to

(A) $a^xb^yc^z$ (B) $a^{-x}b^{-y}c^{-z}$ (C) $a^{2x}b^{2y}c^{2z}$ (D) zero

66. If D = $\begin{vmatrix} a^2+1 & ab & ac \\ ba & b^2+1 & bc \\ ca & cb & c^2+1 \end{vmatrix}$ then D equal to

(A) $2 + a^2 + b^2 + c^2$ (B) $a^2b^2c^2$
(C) bc + ca + ab (D) zero

67. If a, b & c are non–zero real numbers then

D = $\begin{vmatrix} b^2c^2 & bc & b+c \\ c^2a^2 & ca & c+a \\ a^2b^2 & ab & a+b \end{vmatrix}$ equal to

(A) abc (B) $a^2b^2c^2$ (C) bc+ca+ab (D) zero

68. The determinant $\begin{vmatrix} b_1+c_1 & c_1+a_1 & a_1+b_1 \\ b_2+c_2 & c_2+a_2 & a_2+b_2 \\ b_3+c_3 & c_3+a_3 & a_3+b_3 \end{vmatrix}$

(A) $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ (B) $2\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$

(C) $3\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ (D) None of these

69. If x, y, z $\in$ R $\Delta = \begin{vmatrix} x & x+y & x+y+z \\ 2x & 5x+2y & 7x+5y+2z \\ 3x & 7x+3y & 9x+7y+3z \end{vmatrix} = -16$ then value of x is

(A) −2 (B) −3 (C) 2 (D) 3

70. The determinant $\begin{vmatrix} \cos(\theta+\phi) & -\sin(\theta+\phi) & \cos 2\phi \\ \sin\theta & \cos\theta & \sin\phi \\ -\cos\theta & \sin\theta & \cos\phi \end{vmatrix}$ is

(A) 0 (B) independent of θ
(C) independent of ϕ (D) independent of θ & ϕ both

71. If $\begin{vmatrix} 1 & a^2 & a^4 \\ 1 & b^2 & b^4 \\ 1 & c^2 & c^4 \end{vmatrix} = k \begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}$ then k is

(A) (a + b) (b + c) (c + a) (B) ab + bc + ac
(C) $a^2b^2c^2$ (D) $a^2 + b^2 + c^2$

72. If a $\neq$ b, then the system of equations ax+by+bz=0, bx + ay + bz = 0, bx + by + ax = 0 will have a non−trivial solution if

(A) a + b = 0 (B) a + 2b = 0
(C) 2a + b = 0 (D) a + 4b = 0

73. Value of $\Delta = \begin{vmatrix} \sin(2\alpha) & \sin(\alpha+\beta) & \sin(\alpha+\gamma) \\ \sin(\beta+\alpha) & \sin(2\beta) & \sin(\gamma+\beta) \\ \sin(\gamma+\alpha) & \sin(\gamma+\beta) & \sin(2\gamma) \end{vmatrix}$ is

(A) $\Delta = 0$ (B) $\Delta = \sin^2\alpha + \sin^2\beta + \sin^2\gamma$
(C) $\Delta = 3/2$ (D) None of these

74. The determinant D = $\begin{vmatrix} a^2(1+x) & ab & ac \\ ab & b^2(1+x) & bc \\ ac & bc & c^2(1+x) \end{vmatrix}$

is divisible by

(A) 1 + x (B) $(1 + x)^2$ (C) x^2 (D) $x^2 + 1$

75. If A, B, C are angles of a triangle ABC, then

$\begin{vmatrix} \sin\frac{A}{2} & \sin\frac{B}{2} & \sin\frac{C}{2} \\ \sin(A+B+C) & \sin\frac{B}{2} & \sin\frac{A}{2} \\ \cos\frac{(A+B+C)}{2} & \tan(A+B+C) & \sin\frac{C}{2} \end{vmatrix}$ is less than or equal to

(A) $\frac{3\sqrt{3}}{8}$ (B) $\frac{1}{8}$ (C) $2\sqrt{2}$ (D) 2

76. Let 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) 4 (B) 6 (C) 8 (D) 12

77. Value of the D = $\begin{vmatrix} a^3-x & a^4-x & a^5-x \\ a^5-x & a^6-x & a^7-x \\ a^7-x & a^8-x & a^9-x \end{vmatrix}$ is

(A) 0 (B) $(a^3 - 1)(a^6 - 1)(a^9 - 1)$
(C) $(a^3 + 1)(a^6 + 1)(a^9 + 1)$ (D) $a^{15} - 1$

78. If f(x) = $\begin{vmatrix} a^{-x} & e^{x\ell na} & x^2 \\ a^{-3x} & e^{3x\ell na} & x^4 \\ a^{-5x} & e^{5x\ell na} & 1 \end{vmatrix}$, then

(A) f(x) − f(− x) = 0 (B) f(x) . f(−x) = 0
(C) f(x) + f(−x) = 0 (D) f(x) = f(−x) = 0

79. D = $\begin{vmatrix} 1 & \frac{4\sin B}{b} & \cos A \\ 2a & 8\sin A & 1 \\ 3a & 12\sin A & \cos B \end{vmatrix}$ is (where a, b, c are the sides opposite to angles A, B, C respectively in a triangle)

(A) $\frac{1}{2}$ cos 2A (B) 0
(C) $\frac{1}{2}$ sin 2A (D) $\frac{1}{2}(\cos^2 A + \cos^2 B)$

80. If $\Delta_1 = \begin{vmatrix} 2a & b & e \\ 2d & e & f \\ 4x & 2y & 2z \end{vmatrix}$, $\Delta_2 = \begin{vmatrix} f & 2d & e \\ 2z & 4x & 2y \\ e & 2a & b \end{vmatrix}$, then the value of $\Delta_1 - \Delta_2$ is

(A) $x + \frac{y}{2} + z$ (B) 2 (C) 0 (D) 3

81. If $\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = k\,abc(a+b+c)^3$, then k is

(A) 1 (B) 2 (C) 0 (D) ab + bc + ac

82. If $U_n = \begin{vmatrix} n & 1 & 5 \\ n^2 & 2N+1 & 2N+1 \\ n^3 & 3N^2 & 3N+1 \end{vmatrix}$, then $\sum_{n=1}^{N} U_n$ is equal to

(A) $2\sum_{n=1}^{N} n$ (B) $2\sum_{n=1}^{N} n^2$ (C) $\frac{1}{2}\sum_{n=1}^{N} n^2$ (D) 0