1. The value of λ and μ for which the equation $x + y + z = 3$, $x + 3y + 2z = 6$ and $x + \lambda y + 3z = \mu$ have -

(a) A unique solution ; if $\lambda = 5$, $\mu \in R$

(b) No. solution; if $\lambda \neq 5$, $\mu = 9$

(c) Infinitely many solution ; if $\lambda = 5$, $\mu = 9$

(d) None of these

2. If a,b,c are sides of ΔABC and $\begin{vmatrix} a^2 & b^2 & c^2 \\ (a+1)^2 & (b+1)^2 & (c+1)^2 \\ (a-1)^2 & (b-1)^2 & (c-1)^2 \end{vmatrix} = 0$, then -

(a) ABC is an equilateral triangle

(b) ABC is right angled triangle

(c) ABC is an isosceles triangle

(d) None of these

3. If $\Delta_1 = \begin{vmatrix} x & b & b \\ a & x & b \\ a & a & x \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} x & b \\ a & x \end{vmatrix}$ are the given determinants, then -

(a) $\Delta_1 = 3(\Delta_2)^2$

(b) $\frac{d}{dx}(\Delta_1) = 3\Delta_2$

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

(d) $\Delta_1 = 3(\Delta_2)^{3/2}$

4. 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) 1 (b) 3 (c) 0 (d) 2

5. If ω be a complex cube root of unity, then $\begin{vmatrix} 1 & \omega & -\omega^2/2 \\ 1 & 1 & 1 \\ 1 & -1 & 0 \end{vmatrix}$ is equal to-

(a) 0 (b) 1 (c) ω (d) ω^2

6. If a, b, c are non zero real numbers, then $\begin{vmatrix} bc & ca & ab \\ ca & ab & bc \\ ab & bc & ca \end{vmatrix}$ vanishes when

(a) $\frac{1}{a} - \frac{1}{b} - \frac{1}{c} = 0$

(b) $\frac{1}{a} + \frac{1}{b} + \frac{1}{c} = 0$

(c) $\frac{1}{b} - \frac{1}{c} - \frac{1}{a} = 0$

(d) $\frac{1}{b} - \frac{1}{c} + \frac{1}{a} = 0$

7. If $C = 2\cos\theta$. Then value of the determinant

$\Delta = \begin{vmatrix} C & 1 & 0 \\ 1 & C & 1 \\ 6 & 1 & C \end{vmatrix}$ is

(a) $\frac{\sin 4\theta}{\sin\theta}$

(b) $\frac{2\sin^2 2\theta}{\sin\theta}$

(c) $4\cos^2\theta(2\cos\theta - 1)$

(d) None of these

8. The value of determinant $\begin{vmatrix} 1 & x & y+z \\ 1 & y & z+x \\ 1 & z & x+y \end{vmatrix}$ is:

(a) 0

(b) $x + y + z$

(c) $1 + x + y + z$

(d) $(x - y)(y - z)(z - x)$

9. If $ax^3 + bx^2 + cx + d$

$= \begin{vmatrix} x^2 & (x-1)^2 & (x-2)^2 \\ (x-1)^2 & (x-2)^2 & (x-3)^2 \\ (x-2)^2 & (x-3)^2 & (x-4)^2 \end{vmatrix}$, Then :

(a) $a = 1, b = 2, c = 3, d = -8$

(b) $a = -1, b = 2, c = 3, d = -8$

(c) $a = 0, b = 0, c = 0, d = 8$

(d) $a = 0, b = 0, c = 0, d = -8$

10. If $\alpha = \begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$, then

(a) $\alpha = -1$ (b) $\alpha = 1$ (c) $\alpha = 0$ (d) None of these

11. If $A + B + C = \pi$, then 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 equal

(a) 2 sin B. tan A. cos C

(b) 0

(c) 1

(d) None of these

12. The value of $\begin{vmatrix} 1990 & 1991 & 1992 \\ 1991 & 1992 & 1993 \\ 1992 & 1993 & 1994 \end{vmatrix}$ is

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

13. $\begin{vmatrix} a+b & a+2b & a+3b \\ a+2b & a+3b & a+4b \\ a+4b & a+5b & a+6b \end{vmatrix} =$

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

(b) 0

(c) $a^3 + b^3 + c^3 - 3abc$

(d) None of these

14. If A, B, C are angles of a triangle and

$\begin{vmatrix} 1 & 1 & 1 \\ 1+\sin A & 1+\sin B & 1+\sin C \\ \sin A+\sin^2 A & \sin B+\sin^2 B & \sin C+\sin^2 C \end{vmatrix} = 0$ then

triangle ABC is
(a) Right angled isosceles (b) Isosceles
(c) Equilateral (d) n = 0

15. If x, y, z are integers in A.P., lying between 1 and 9, and x51, y41 and z31 are three digit numbers then the value of

$$\begin{vmatrix} 5 & 4 & 3 \\ x51 & y41 & z31 \\ x & y & z \end{vmatrix} \text{ is}$$

(a) x + y + z (b) 0 (c) x - y + z (d) x - y - z

16. If $\Delta_1 = \begin{vmatrix} f & 2d & e \\ 2z & 4x & 2y \\ e & 2a & b \end{vmatrix}$ & $\Delta_2 = \begin{vmatrix} 2a & b & e \\ 2d & e & f \\ 4x & 2y & 2z \end{vmatrix}$ then $\frac{\Delta_1}{\Delta_2} =$

(a) 1 (b) 2 (c) ½ (d) None

17. If $U_n = \begin{vmatrix} 1 & k & k \\ 2n & k^2+k+1 & k^2+k \\ 2n-1 & k^2 & k^2+k+1 \end{vmatrix}$ and

$\sum_{n=1}^{k} U_n = 72$ then k =

(a) 8 (b) 9 (c) 6 (d) None of these

18. With 1 ω, ω^2 as cube roots of unity, inverse of which following matrices exists?

(a) $\begin{bmatrix} 1 & \omega \\ \omega & \omega^2 \end{bmatrix}$ (b) $\begin{bmatrix} \omega^2 & 1 \\ 1 & \omega \end{bmatrix}$

(c) $\begin{bmatrix} \omega & \omega^2 \\ \omega^2 & 1 \end{bmatrix}$ (d) None

19. The inverse of a skew symmetric matrix (if it exists) is -
(a) A symmetric matrix (b) A skew symmetric matrix
(c) A diagonal matrix (d) None of these

20. The value of x for which the matrix $A = \begin{bmatrix} 2/x & -1 & 2 \\ 1 & x & 2x^2 \\ 1 & 1/x & 2 \end{bmatrix}$ is singular is-

(a) ± 1 (b) ± 2 (c) ± 3 (d) None of these

21. Let A be a square matrix of order 3 such that |A| = 5. Then |adj (adj A)| =
(a) 625 (b) 125 (c) 3025 (d) None

22. If A, B are symmetric matrices of the same order then (AB - BA) is -
(a) Symmetric matrix (b) Skew-symmetric matrix
(c) Null matrix (d) Unit matrix

23. Let $A + 2B = \begin{bmatrix} 1 & 2 & 0 \\ 6 & -3 & 3 \\ -5 & 3 & 1 \end{bmatrix}$ and $2A - B = \begin{bmatrix} 2 & -1 & 5 \\ 2 & -1 & 6 \\ 0 & 1 & 2 \end{bmatrix}$ then Tr(a) - Tr(b) has the value equal to

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

24. If A is an involuntary matrix given by $A = \begin{bmatrix} 0 & 1 & -1 \\ 4 & -3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$ then the inverse of $\frac{A}{2}$ will be

(a) 2A (b) $\frac{A^{-1}}{2}$ (c) $\frac{A}{2}$ (d) A^2

25. For a given matrix $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ which of the following statement holds good:
(a) $A = A^{-1} \forall\ \theta \in R$
(b) A is symmetric, for $\theta = (2n+1)\frac{\pi}{2}$, $n \in I$
(c) A is orthogonal matrix for $\theta \in R$
(d) A is skew symmetric, for $\theta = n\pi$, $n \in I$

26. There are two possible value of A in the solution of the matrix equation $\begin{bmatrix} 2A+1 & -5 \\ -4 & A \end{bmatrix}^{-1} \begin{bmatrix} A-5 & B \\ 2A-2 & C \end{bmatrix} = \begin{bmatrix} 14 & D \\ E & F \end{bmatrix}$, where A, B, C, D, E, F are real numbers. The absolute value of the difference of these two solutions, is:

(a) $\frac{8}{3}$ (b) $\frac{11}{3}$ (c) $\frac{1}{3}$ (d) $\frac{19}{3}$

27. Let A and B be two 2 × 2 matrices. Consider the statements
(i) AB = O ⇒ A = O or B = O
(ii) $AB = I_2 \Rightarrow A = B^{-1}$
(iii) $(A + B)^2 = A^2 + 2AB + B^2$
Then
(a) (i) is false, (ii) and (iii) are true
(b) (i) and (iii) are false, (ii) is true
(c) (i) and (ii) are false, (iii) is true
(d) (ii) and (iii) are false, (i) is true

28. If $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & x & 1 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1/2 & -1/2 & 1/2 \\ -4 & 3 & y \\ 5/2 & -3/2 & 1/2 \end{bmatrix}$, then -

(a) x = 1, y = -1 (b) x = -1, y = 1
(c) x = 2, y = -1/2 (d) x = 1/2, y = ½

29. If A is a 3 × 3 skew-symmetric matrix, then |A| is given by -

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

30. For each real x such that $-1 < x < 1$. Let A (x) denote the matrix $(1 - x)^{-1/2}\begin{pmatrix} 1 & -x \\ -x & 1 \end{pmatrix}$ and A(x) A(y) = k A(z) where x, $y \in R$, $-1 < x, y < 1$ and $z = \dfrac{x+y}{1+xy}$ then k is -

(a) $\dfrac{1}{\sqrt{1+xy}}$ (b) $\dfrac{x}{\sqrt{1+xy}}$

(c) $\sqrt{1+xy}$ (d) $\dfrac{\sqrt{1+xy}}{x}$