1. The value of $\Delta = \begin{vmatrix} {}^{10}C_4 & {}^{10}C_5 & {}^{11}C_m \\ {}^{11}C_6 & {}^{11}C_7 & {}^{12}C_{m+2} \\ {}^{12}C_8 & {}^{12}C_9 & {}^{13}C_{m+4} \end{vmatrix}$ is equal to zero, where m is

(a) 6 (b) 4 (c) 5 (d) None of these

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

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

3. The value of $\begin{vmatrix} 1 & 1 & 1 \\ (2^x+2^{-x})^2 & (3^x+3^{-x})^2 & (5^x+5^{-x})^2 \\ (2^x-2^{-x})^2 & (3^x-3^{-x})^2 & (5^x-5^{-x})^2 \end{vmatrix}$

(a) 0 (b) 30^x (c) 30^{-x} (d) None of these

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

(a) $x+y+z$ (b) $x-y+z$ (c) 0 (d) None of these

5. If $a \neq b \neq c$, the value of x which satisfies the equation $\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$ is

(a) $x=0$ (b) $x=a$ (c) $x=b$ (d) $x=c$

6. The number of distinct real roots of $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$ in the interval $-\frac{\pi}{4} \le x \le \frac{\pi}{4}$ is

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

7. If $p\lambda^4 + q\lambda^3 + r\lambda^2 + s\lambda + t = \begin{vmatrix} \lambda^2+3\lambda & \lambda-1 & \lambda+3 \\ \lambda+1 & 2-\lambda & \lambda-4 \\ \lambda-3 & \lambda+4 & 3\lambda \end{vmatrix}$, then value of t is

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

8. If $D_p = \begin{vmatrix} p & 15 & 8 \\ p^2 & 35 & 9 \\ p^3 & 25 & 10 \end{vmatrix}$, then $D_1 + D_2 + D_3 + D_4 + D_5 =$

(a) 0 (b) 25 (c) 625 (d) None of these

9. The value of $\sum_{n=1}^{N} U_n$, if $U_n = \begin{vmatrix} n & 1 & 5 \\ n^2 & 2N+1 & 2N+1 \\ n^3 & 3N^2 & 3N \end{vmatrix}$ is

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

10. 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) $\frac{d}{dx}(\Delta_1) = 2(\Delta_2)^2$ (d) $\Delta_1 = 3\Delta_2^{3/2}$

11. If $y = \sin mx$, then the value of the determinant $\begin{vmatrix} y & y_1 & y_2 \\ y_3 & y_4 & y_5 \\ y_6 & y_7 & y_8 \end{vmatrix}$, where $y_n = \frac{d^n y}{dx^n}$ is

(a) m^9 (b) m^2 (c) m^3 (d) None of these

12. If the system of equations $x + ay = 0$, $az + y = 0$ and $ax + z = 0$ has infinite solutions, then the value of a is

(a) -1 (b) 1 (c) 0 (d) No real values

13. If the system of equations $ax + y + z = 0$, $x + by + z = 0$ and $x + y + cz = 0$, where $a, b, c \neq 1$ has a non-trivial solution, then the value of $\frac{1}{1-a} + \frac{1}{1-b} + \frac{1}{1-c}$ is

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

14. If the system of equations $x + 2y - 3z = 1$, $(k+3)z = 3$, $(2k+1)x + z = 0$ is inconsistent, then the value of k is

(a) -3 (b) $\frac{1}{2}$ (c) 0 (d) 2

15. Theequations $x + y + z = 6$, $x + 2y + 3z = 10$, $x + 2y + mz = n$ give infinite number of values of the triplet (x, y, z) if

(a) $m = 3,\ n \in R$ (b) $m = 3,\ n \neq 10$

(c) $m = 3,\ n = 10$ (d) None of these

16. If $f(\theta) = \begin{vmatrix} 1 & 1 & -1 \\ 1 & e^{i\theta} & 1 \\ 1 & -1 & -e^{-i\theta} \end{vmatrix}$ then

(a) $\int_{-\pi/2}^{\pi/2} f(\theta)d\theta = 2\int_{0}^{\pi/2} f(\theta)d\theta$ (b) $f(\theta)$ is purely real

(c) $f(\pi/2) = 2$ (d) None of these

17. If a, b, & c are sides of a 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) ΔABC is an equilateral triangle`
(b) ΔABC is a right angled triangle
(c) ΔABC is an Isosceles triangle
(d) None of these

18. Let $ax^7 + bx^6 + cx^5 + dx^4 + ex^3 + fx^2 + gx + h =$

$$\begin{vmatrix} (x+1) & (x^2+2) & (x^2+x) \\ (x^2+x) & (x+1) & (x^2+2) \\ (x^2+2) & (x^2+x) & x+1 \end{vmatrix}$$. Then

(a) g = 3 and h = - 5 (b) g = -3 and h = - 5
(c) g = -3 and h = -9 (d) None of these

19. If $\begin{vmatrix} y+z & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix} = k(xyz)$, then k is equal to

(a) 4 (b) -4 (c) Zero (d) None of these

20. $\begin{vmatrix} 109 & 102 & 95 \\ 6 & 13 & 20 \\ 1 & -6 & -13 \end{vmatrix}$ is equal to

(a) Constant other than zero (b) Zero
(c) 100 (d) -1997

21. $\Delta = \begin{vmatrix} p & 2-i & i+1 \\ 2+i & q & 3+i \\ 1-i & 3-i & r \end{vmatrix}$ is always

(a) Real (b) Imaginary (c) Zero (d) None of these

22. If $\Delta = \begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix} = \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$ then

(a) Δ = (a-b) (b-c) (c-a) (b) a, b, c are in G.P.
(c) b, c, a are in G.P. (d) a, c, b are in G.P.

23. The number of values of $\theta \in [0, \pi]$ such that $\lambda = \cos^3\theta + \sin^3\theta$ and system of equation $3x - y + 4z = 3$, $x + 2y - 3z = -2$, $6x + 5y + 5\lambda z = -3$ does not have a unique solution is / are -

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

24. If $a_1, a_2, a_3, \ldots, a_9$ are in H.P. and $a_4 = 5$, $a_5 = 4$, then the value of $\begin{vmatrix} a_1 & a_2 & a_3 \\ a_4 & a_5 & a_6 \\ a_7 & a_8 & a_9 \end{vmatrix}$ is-

(a) 31/15 (b) 41/18 (c) 50/21 (d) 61/27

25. If $\Delta = \begin{vmatrix} e^x & \sin x & 1 \\ \cos x & \ell n(1+x^2) & 1 \\ x & x^2 & 1 \end{vmatrix} = a + bx + cx^2$ then the value of b is

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