GPLUS EDUCATION

Date :
Time : **MATHEMATICS**
Marks :

DETERMINANTS

Single Correct Answer Type

1. For the values of A, B, C and P, Q, R the value of $\begin{vmatrix} \cos(A-P) & \cos(A-Q) & \cos(A-R) \\ \cos(B-P) & \cos(B-Q) & \cos(B-R) \\ \cos(C-P) & \cos(C-Q) & \cos(C-R) \end{vmatrix}$ is

   a) 0 b) $\cos A \cos B \cos C$ c) $\sin A \sin B \sin C$ d) $\cos P \cos Q \cos R$

2. If x, y, z are in AP, then the value of the det A is, where $A = \begin{vmatrix} 4 & 5 & 6 & x \\ 5 & 6 & 7 & y \\ 6 & 7 & 8 & z \\ x & y & z & 0 \end{vmatrix}$

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

3. $\begin{vmatrix} a-b & b-c & c-a \\ x-y & y-z & z-x \\ p-q & p-r & r-p \end{vmatrix}$ is equal to

   a) $a(x+y+z)+b(p+q+r)+c$ b) 0
   c) $abc+xyz+ppr$ d) None of the above

4. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and $|A^3| = 125$, then the value of α is

   a) ± 1 b) ± 2 c) ± 3 d) ± 5

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

6. The value of $\Delta = \begin{vmatrix} a & a+b & a+2b \\ a+2b & a & a+b \\ a+b & a+2b & a \end{vmatrix}$ is equal to

   a) $9a^2(a+b)$ b) $9b^2(a+b)$ c) $a^2(a+b)$ d) $b^2(a+b)$

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

8. $\begin{vmatrix} \alpha & -\beta & 0 \\ 0 & \alpha & \beta \\ \beta & 0 & \alpha \end{vmatrix} = 0$, then

   a) $\frac{\alpha}{\beta}$ is one of the cube roots of unity b) α is one of the cube roots of unity
   c) β is one of the cube roots of unity d) $\alpha\beta$ is one of the cube roots of unity

9. The repeated factor of the determinant $\begin{vmatrix} y+z & x & y \\ z+x & z & x \\ x+y & y & z \end{vmatrix}$, is

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

10. The value of $\begin{vmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 1 & \log_y z \\ \log_z x & \log_z y & 1 \end{vmatrix}$ is equal to

a) 0 b) 1 c) xyz d) $\log xyz$

11. The value of the determinant, $\begin{vmatrix} \sqrt{13}+\sqrt{3} & 2\sqrt{5} & \sqrt{5} \\ \sqrt{15}+\sqrt{26} & 5 & \sqrt{10} \\ 3+\sqrt{65} & \sqrt{15} & 5 \end{vmatrix}$ is

a) $5(\sqrt{6}-5)$ b) $5\sqrt{3}(\sqrt{6}-5)$ c) $\sqrt{5}(\sqrt{6}-\sqrt{3})$ d) $\sqrt{2}(\sqrt{7}-\sqrt{5})$

12. The value of the determinant

$\begin{vmatrix} \cos\alpha & -\sin\alpha & 1 \\ \sin\alpha & \cos\alpha & 1 \\ \cos(\alpha+\beta) & -\sin(\alpha+\beta) & 1 \end{vmatrix}$ is

a) Independent of α b) Independent of β

c) Independent of α and β d) None of these

13. In a third order determinant, each element of the first column consists of sum of two terms, each element of the second column consists of sum of three terms and each element of the third column consists of sum of four terms. Then, it can be decomposed into n determinant, where n has the value

a) 1 b) 9 c) 16 d) 24

14. If $\begin{vmatrix} x & y & z \\ -x & y & z \\ x & -y & z \end{vmatrix} = kxyz$, then k is equal to

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

15. If $\Delta_1 = \begin{vmatrix} 10 & 4 & 3 \\ 17 & 7 & 4 \\ 4 & -5 & 7 \end{vmatrix}$, $\Delta_2 = \begin{vmatrix} 4 & x+5 & 3 \\ 7 & x+12 & 4 \\ -5 & x-1 & 7 \end{vmatrix}$ such that $\Delta_1 + \Delta_2 = 0$, is

a) $x = 5$ b) $x = 0$ c) x has no real value d) None of these

16. If $\Delta(x) = \begin{vmatrix} f(x)+f(-x) & 0 & x^4 \\ 3 & f(x)-f(-x) & \cos x \\ x^4 & 2x & f(x)f(-x) \end{vmatrix}$ (where $f(x)$ is a real valued function of x), then the value of $\int_{-2}^{2} x^4 \Delta(x)$

a) Depends upon the function $f(x)$ b) is 4

c) is -4 d) is zero

17. 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) 0 d) 1

18. If $D_r = \begin{vmatrix} r & 1 & \frac{n(n+1)}{2} \\ 2r-1 & 4 & n^2 \\ 2^{r-1} & 5 & 2^n - 1 \end{vmatrix}$, then the value of $\sum_{r=0}^{n} D_r$ is

a) 0 b) 1 c) $\frac{n(n+1)(2n+1)}{6}$ d) None of these

19. $\begin{vmatrix} x & p & q \\ p & x & q \\ q & q & x \end{vmatrix} =$

a) $(x+p)(x+q)(x-p-q)$

b) $(x-p)(x-q)(x+p+q)$

c) $(x-p)(x-q)(x-p-q)$

d) $(x+p)(x+q)(x+p+q)$

20. The value of the determinant $\begin{vmatrix} 10! & 11! & 12! \\ 11! & 12! & 13! \\ 12! & 13! & 14! \end{vmatrix}$ is

a) 2 (10! 11!) b) 2 (10! 13!) c) 2 (10! 11! 12!) d) 2 (11! 12! 13!)

21. If $a=1+2+4+\cdots$to n terms, $b=1+3+9+\cdots$to n terms and $c=1+5+25+\cdots$ to n terms, then$\begin{vmatrix} a & 2b & 4c \\ 2 & 2 & 2 \\ 2^n & 3^n & 5^n \end{vmatrix}$ equals

a) $(30)^n$ b) $(10)^n$ c) 0 d) $2^n+3^n+5^n$

22. The value of $\begin{vmatrix} \log_5 729 & \log_3 5 \\ \log_5 27 & \log_9 25 \end{vmatrix}\begin{vmatrix} \log_3 5 & \log_{27} 5 \\ \log_5 9 & \log_5 9 \end{vmatrix}$ is equal to

a) 1 b) 6 c) $\log_5 9$ d) $\log_3 5.\log_5 81$

23. If $\begin{vmatrix} \alpha & x & x & x \\ x & \beta & x & x \\ x & x & \gamma & x \\ x & x & x & \delta \end{vmatrix}=f(x)-xf'(x)$ then $f(x)$ is equal to

a) $(x-\alpha)(x-\beta)(x-\gamma)(x-\delta)$

b) $(x+\alpha)(x+\beta)(x+\gamma)(x+\delta)$

c) $2(x-\alpha)(x-\beta)(x-\gamma)(x-\delta)$

d) None of these

24. If $\Delta(x)=\begin{vmatrix} x^n & \sin x & \cos x \\ n! & sin\frac{n\pi}{2} & \cos\frac{n\pi}{2} \\ a & a^2 & a^3 \end{vmatrix}$, then the value of $\frac{d^n}{dx^n}[\Delta(x)]$at $x=0$ is

a) -1 b) 0 c) 1 d) Dependent of a

25. The value of $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix}$, is

a) 6 abc b) $a+b+c$ c) 4 abc d) abc

26. The value of x obtained from the equation $\begin{vmatrix} x+\alpha & \beta & \gamma \\ \gamma & x+\beta & \alpha \\ \alpha & \beta & x+\gamma \end{vmatrix}=0$ will be

a) 0 and – $(\alpha+\beta+\gamma)$ b) 0 and $(\alpha+\beta+\gamma)$

c) 1 and $(\alpha-\beta-\gamma)$ d) 0 and $(\alpha^2+\beta^2+\gamma^2)$

27. If $\begin{vmatrix} x & 2 & 3 \\ 2 & 3 & x \\ 3 & x & 2 \end{vmatrix}=\begin{vmatrix} 1 & x & 4 \\ x & 4 & 1 \\ 4 & 1 & x \end{vmatrix}=\begin{vmatrix} 0 & 5 & x \\ 5 & x & 0 \\ x & 0 & 5 \end{vmatrix}=0$, then the value of x values $(x\in R)$:

a) 0 b) 5 c) -5 d) None of these

28. The value of the following determinant is

$\Delta=\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^3 & b^3 & c^3 \end{vmatrix}$

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

c) $(a-b)(b-c)(c-a)$ d) None of the above

29. The value of $\begin{vmatrix} x & 4 & y+z \\ y & 4 & z+x \\ z & 4 & x+y \end{vmatrix}$, is

a) 4 b) $x+y+z$ c) xyz d) 0

30. If $f(x)$, g(x) and $h(x)$ are three polynomials of degree 2 and $\Delta(x)=\begin{vmatrix} f(x) & g(x) & h(x) \\ f'(x) & g'(x) & h'(x) \\ f''(x) & g''(x) & h''(x) \end{vmatrix}$, then $\Delta(x)$ is polynomial of degree

a) 2 b) 3 c) At most 2 d) At most 3

31. A is a square matrix of order 4 and I is a unit matrix, then it is true that

a) $det(2A)=2det(A)$ b) $\det(2A)=16\det(A)$

c) $\det(-A)=-\det(A)$ d) $\det(A+I)=det(A)+I$

32. 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

33. If $\Delta_r = \begin{vmatrix} 1 & n & n \\ 2r & n^2+n+1 & n^2+n \\ 2r-1 & n^2 & n^2+n+1 \end{vmatrix}$ and $\sum_{r=1}^{n} \Delta_r = 56$, then n equals

a) 4 b) 6 c) 7 d) 8

34. If $1, \omega, \omega^2$ are the cube roots of unity, then

$\Delta = \begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega^n & \omega^{2n} & 1 \\ \omega^{2n} & 1 & \omega^n \end{vmatrix}$ is equal to

a) 0 b) 1 c) ω d) ω^2

35. If matrix $\begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ \lambda & -3 & 0 \end{bmatrix}$ is singular, then λ is equal to

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

36. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}$, then the value of the determinant $|A^{2009} - 5A^{2008}|$ is

a) -6 b) -5 c) -4 d) 4

37. The value of $\begin{vmatrix} 441 & 442 & 443 \\ 445 & 446 & 447 \\ 449 & 450 & 451 \end{vmatrix}$ is

a) $441 \times 446 \times 4510$ b) 0 c) -1 d) 1

38. If $a \neq b$, then the system of equation

$ax + by + bz = 0$

$bx + ay + bz = 0$

$bx + by + az = 0$

Will have a non-trivial solution, is

a) $a + b = 0$ b) $a + 2b = 0$ c) $2a + b = 0$ d) $a + 4b = 0$

39. The value of θ lying between $\theta = 0$ and $\frac{\pi}{2}$ and satisfying

the equation $\begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & 1+\cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & \cos^2\theta & 1+4\sin 4\theta \end{vmatrix}$ is

a) $\frac{7\pi}{24}$ b) $\frac{5\pi}{24}$ c) $\frac{11\pi}{2}$ d) $\frac{\pi}{24}$

40. $\begin{vmatrix} a-b+c & -a-b+c & 1 \\ a+b+2c & -a+b+2c & 2 \\ 3c & 3c & 3 \end{vmatrix}$ is

a) $6ab$ b) ab c) $12ab$ d) $2ab$

41. The arbitrary constant on which the value of the

Determinant $\begin{vmatrix} 1 & a & a^2 \\ \cos(p-d)\,a & \cos pa & \cos(p-d)\,a \\ \sin(p-d)\,a & \sin pa & \sin(p-d)\,a \end{vmatrix}$

Does not depend, is

a) α b) p c) d d) a

42. If $a \neq b \neq c$, then the value of x satisfying the equation

$\begin{vmatrix} 0 & x^2-a & a-b \\ x+a & 0 & x-c \\ x+b & x-c & 0 \end{vmatrix} = 0$ is

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

43. A factor of $\Delta(x)=\begin{vmatrix} x^3+1 & 2x^4+3x^2 & 3x^5+4x \\ 2 & 5 & 7 \\ 3 & 14 & 19 \end{vmatrix}$ is

a) x b) $(x-1)^2$ c) $(x+1)^2$ d) None of these

44. The value of determinant $\begin{vmatrix} b+c & a+b & a \\ c+a & b+c & b \\ a+b & c+a & c \end{vmatrix}$ is equal to

a) $a^3+b^3+c^3-3\,abc$ b) $2abc(a+b+c)$ c) 0 d) None of these

45. Let $D_r=\begin{vmatrix} 2^{r-1} & 2.3^{r-1} & 4.5^{r-1} \\ \alpha & \beta & \gamma \\ 2^n-1 & 3^n-1 & 5^n-1 \end{vmatrix}$. Then, the value of $\sum_{r=1}^{n} D_r$ is

a) $\alpha\,\beta\,\gamma$ b) $2^n\,\alpha+2^n\,\beta+4^n\,\gamma$ c) $2\,\alpha+3\,\beta+4\,\gamma$ d) None of these

46. If $\begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 40 & 3 & i \end{vmatrix}=x+iy$, then

a) $x=3, y=1$ b) $x=1, y=3$ c) $x=0, y=3$ d) $x=0, y=0$

47. From the matrix equation $AB=AC$ we can conclude $B=C$ provided that

a) A is singular b) A is non-singular c) A is symmetric d) A is square

48. If $\begin{vmatrix} a & \cot\frac{A}{2} & \lambda \\ b & \cot\frac{B}{2} & \mu \\ c & \cot\frac{C}{2} & \gamma \end{vmatrix}=0$ where, a, b, c A, B and C are elements of a ΔABC with usual meaning. Then, the value of $a(\mu-\gamma)+b(\gamma-\lambda)+c(\lambda-\mu)$ is

a) 0 b) abc c) $ab+bc+ca$ d) $2\,abc$

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

a) 0 b) 30^x c) 30^{-x} d) 1

50. $\begin{vmatrix} bc & bc'+b'c & b'c' \\ ca & ca'+c'a & c'a' \\ ab & ab'+a'b & a'b' \end{vmatrix}$ is equal to

a) $(ab-a'b')(bc-b'c')(ca-c'a')$

b) $(ab+a'b')(bc+b'c')(ca+c'a')$

c) $(ab'-a'b)(bc'-b'c)(ca'-c'a)$

d) $(ab'+a'b)(bc'+b'c)(ca'+c'a)$

51. If ω is the cube root of unity, then $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix}$ is equal to

a) 1 b) 0 c) ω d) ω^2

52. If [ ] denotes the greatest integer less than or equal to the real number under consideration and $-1\le x<0; 0\le y<1; 1\le z<2$, then the value of the determinant $\begin{vmatrix} [x]+1 & [y] & [z] \\ [x] & [y]+1 & [z] \\ [x] & [y] & [z]+1 \end{vmatrix}$ is

a) $[x]$ b) $[y]$ c) $[z]$ d) None of these

53. If $\alpha+\beta+\gamma=\pi$, then the value of the determinant

$\begin{vmatrix} e^{2i\,\alpha} & e^{-i\,\gamma} & e^{-i\,\beta} \\ e^{-i\gamma} & e^{2i\,\beta} & e^{-i\,\alpha} \\ e^{-i\beta} & e^{-i\,\alpha} & e^{2i\,\gamma} \end{vmatrix}$, is

a) 4 b) -4 c) 0 d) None of these

54. If a, b, c are the sides of a ΔABC and A, B, C are respectively the angles opposite to them, then

$\begin{vmatrix} a^2 & b\sin A & c\sin A \\ b\sin A & 1 & \cos(B-C) \\ c\sin A & \cos(B-C) & 1 \end{vmatrix}$ equals

a) $\sin A - \sin B \sin C$ b) abc c) 1 d) 0

55. If $x \neq 0$, $\begin{vmatrix} x+1 & 2x+1 & 3x+1 \\ 2x & 4x+3 & 6x+3 \\ 4x+4 & 6x+4 & 8x+4 \end{vmatrix}$=0, then $x+1$ is equal to

a) x b) 0 c) $2x$ d) $3x$

56. If $p\lambda^4 + q\lambda^3 + q\lambda^2 + s\lambda + t = \begin{vmatrix} b^2+c^2 & a^2+\lambda & a^2+\lambda \\ b^2+\lambda & c^2+a^2 & b^2+\lambda \\ c^2+\lambda & c^2+\lambda & a^2+b^2 \end{vmatrix}$ is an identity in λ, where p, q, r, s, t are constants, then the value of t is

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

57. If A and B are two matrices such that $A+B$ and AB are both defined, then

a) A and B are two matrices not necessarily of same order

b) A and B are square matrices of same order

c) Number of columns of A = Number of rows of B

d) None of these

58. If $\begin{vmatrix} b^2+c^2 & ab & ac \\ ab & c^2+a^2 & bc \\ ca & cb & a^2+b^2 \end{vmatrix} = k\, a^2\, b^2\, c^2$, then k is equal to

a) 3 b) 2 c) 4 d) None of these

59. If $A_i = \begin{bmatrix} a^i & b^i \\ b^i & a^i \end{bmatrix}$ and if $|a| < 1, |b| < 1$,then $\sum_{i=1}^{\infty} \det(A_i)$ is equal to

a) $\dfrac{a^2}{(1-a)^2} - \dfrac{b^2}{(1-b)^2}$ b) $\dfrac{a^2-b^2}{(1-a)^2(1-b^2)}$ c) $\dfrac{a^2}{(1-a)^2} + \dfrac{b^2}{(1-b)^2}$ d) $\dfrac{a^2}{(1+a)^2} - \dfrac{b^2}{(1+b)^2}$

60. The determinant $\Delta = \begin{vmatrix} a^2+x^2 & ab & ac \\ ab & b^2+x^2 & bc \\ ac & bc & c^2+x^2 \end{vmatrix}$ is divisible by

a) x^5 b) x^4 c) x^4+1 d) x^4-1

61. If a, b, c are respectively the pth, qth, rth terms of an AP, then $\begin{vmatrix} a & p & 1 \\ b & q & 1 \\ c & r & 1 \end{vmatrix}$ is equal to

a) 1 b) -1 c) 0 d) pqr

62. If ω is a cube root of unity, then $\begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{vmatrix}$, is equal to

a) x^3+1 b) $x^3+\omega$ c) $x^3+\omega^2$ d) x^3

63. If $a \neq b, b, c$ 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) $ab+bc$

64. If the matrix M_r is given by $M_r = \begin{bmatrix} r & r-1 \\ r-1 & r \end{bmatrix}$ $r = 1, 2, 3\ldots$, then the value of det (M_1) + det(M_2)+…+det(M_{2008}) is

a) 2007 b) 2008 c) $(2008)^2$ d) $(2007)^2$

65. Let the determinant of a 3×3 matrix A be 6, then B is a matrix defined by $B = 5A^2$. Then, determinant of B is

a) 180 b) 100 c) 80 d) None of These

66. If $c < 1$ and the system of equations $x + y - 1 = 0, 2x - y - c = 0$ and $-bx + 3by - c = 0$ is consistent, then the possible real values of b are

a) $b \in \left(-3, \frac{3}{4}\right)$ b) $b \in \left(-\frac{3}{4}, 4\right)$ c) $b \in \left(-\frac{3}{4}, 3\right)$ d) None of these

67. 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

68. 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, which of the following is not correct?

a) Det $(A) = 0$ b) Det $(A) \in (-\infty, 0)$ c) Det $(A) \in [2,4]$ d) Det $(A) \in [-2, \infty)$

69. $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}$ is equal to

a) 0 b) $a+b+c$ c) $(a+b+c)^2$ d) $(a+b+c)^3$

70. The value of determinant $\begin{vmatrix} a+b & a+2b & a+3b \\ a+2b & a+3b & a+4b \\ a+4b & a+5b & a+6b \end{vmatrix}$ is

a) $a^2+b^2+c^2-3abc$ b) $3ab$ c) $3a+5b$ d) 0

71. If $\begin{vmatrix} x^2+x & 3x-1 & -x+3 \\ 2x+1 & 2+x^2 & x^3-3 \\ x-3 & x^2+4 & 3x \end{vmatrix}$

$= a_0 + a_1x + a_2x^2 + \dots + a_7x^7$,

The value of a_0 is

a) 25 b) 24 c) 23 d) 21

72. The determinant $\Delta = \begin{vmatrix} a & b & ax+b \\ b & c & bx+c \\ ax+b & bx+c & 0 \end{vmatrix}$ is equal to zero, if

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) α is a root of $ax^2+bx+c=0$

73. The value of the determinant $\begin{vmatrix} -1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{vmatrix}$ is equal to

a) -4 b) 0 c) 1 d) 4

74. If a, b, c are non-zero real numbers, 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) $\alpha^{-1} = a + b + c$

c) $\alpha + a + b + c = 1$

d) None of these

75. If $f(\alpha) = \begin{vmatrix} 1 & \alpha & \alpha^2 \\ \alpha & \alpha^2 & 1 \\ \alpha^2 & 1 & a \end{vmatrix}$, then $f(\sqrt[3]{3})$ is equal to

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

76. One root of the equation

$\begin{vmatrix} 3x-8 & 3 & 3 \\ 3 & 3x-8 & 3 \\ 3 & 3 & 3x-8 \end{vmatrix} =$

a) 8/3 b) 2/3 c) 1/3 d) 16/3

77. If $\Delta(x) = \begin{vmatrix} 1 & \cos x & 1-\cos x \\ 1+\sin x & \cos x & 1+\sin x-\cos x \\ \sin x & \sin x & 1 \end{vmatrix}$, then $\int_0^{\pi/2} \Delta(x)dx$ is equal to

a) $\frac{1}{4}$ b) $\frac{1}{2}$ c) 0 d) $-\frac{1}{2}$

78. If a, b, c are different, then the value of x satisfying $\begin{vmatrix} 0 & x^2-a & x^3-b \\ x^2+a & 0 & x^2+c \\ x^4+a & x-c & 0 \end{vmatrix} = 0$ is

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

79. The sum of the products of the elements of any row of a determinant A with the cofactors of the corresponding elements is equal to

a) 1 b) 0 c) $|A|$ d) $\frac{1}{2}|A|$

80. 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

81. If A is a 3×3non-singular matrix, then det $(A^{-1}\text{adj } A)$ is equal to

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

82. If a, b, c are unequal what is the condition that the value of the determinant, $\Delta \equiv \begin{vmatrix} a & a^2 & a^3+1 \\ b & b^2 & b^3+1 \\ c & c^2 & c^3+1 \end{vmatrix}$ is 0?

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

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

83. 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 neither x nor y b) Divisible by both x and y

c) Divisible by x but not y d) Divisible by y but not x

84. If $x^a y^b = e^m, x^c y^d = e^n, \Delta_1 = \begin{vmatrix} m & b \\ n & d \end{vmatrix}, \Delta_2 = \begin{vmatrix} a & m \\ c & n \end{vmatrix}$ and $\Delta_3 = \begin{vmatrix} a & b \\ c & d \end{vmatrix}$, then the values of x and y are respectively

a) $\frac{\Delta_1}{\Delta_3}$ and $\frac{\Delta_2}{\Delta_3}$ b) $\frac{\Delta_2}{\Delta_1}$ and $\frac{\Delta_3}{\Delta_1}$

c) $\log\left(\frac{\Delta_1}{\Delta_3}\right)$ and $\log\left(\frac{\Delta_2}{\Delta_3}\right)$ d) e^{Δ_1/Δ_3} and e^{Δ_2/Δ_3}

85. If $0 < \theta < \pi$ and the system of equations

$(\sin\theta)x + y + z = 0$

$x + (\cos\theta)y + z = 0$

$(\sin\theta)x + (\cos\theta)y + z = 0$

Has a non-trivial solution, then $\theta =$

a) $\frac{\pi}{6}$ b) $\frac{\pi}{4}$ c) $\frac{\pi}{3}$ d) $\frac{\pi}{2}$

86. Consider the system of equations

$a_1\, x + b_1\, y + c_1\, z = 0$

$a_1\, x + b_2\, y + c_2\, z = 0$

$a_3\, x + b_3\, y + c_3\, z = 0$

If $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0$, then the system has

a) More than two solutions

b) One trivial and one non-trivial solutions

c) No solution

d) Only trivial solution (0,0,0)

87. If A is an invertible matrix, then $\det(A^{-1})$ is equal to

a) det $b(A)$ b) $\frac{1}{\det(A)}$ c) 1 d) None of these

88. If ω is a cube root of unity, then for polynomial is

$$\begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{vmatrix}$$

a) 1 b) ω c) ω^2 d) 0

89. The equation $\begin{vmatrix} x-a & x-b & x-c \\ x-b & x-c & x-a \\ x-c & x-a & x-b \end{vmatrix} = 0$, where a, b, c are different, is satisfied by

a) $x = 0$ b) $x = a$ c) $x = \frac{1}{3}(a+b+c)$ d) $a = a+b+c$

90. $\begin{vmatrix} 2xy & x^2 & y^2 \\ x^2 & y^2 & 2xy \\ y^2 & 2xy & x^2 \end{vmatrix}$ is equal to

a) $(x^3+y^3)^2$ b) $(x^2+y^2)^3$ c) $-(x^2+y^2)^3$ d) $-(x^3+y^3)^2$

91. Let $\omega = -\frac{1}{2} + i\frac{\sqrt{3}}{2}$, then the value of the determinant

$\begin{vmatrix} 1 & 1 & 1 \\ 1 & -1-\omega^2 & \omega^2 \\ 1 & \omega^2 & \omega^4 \end{vmatrix}$, is

a) 3ω b) $3\omega(\omega-1)$ c) $3\omega^2$ d) $3\omega(1-\omega)$

92. Using the factor theorem it is found that $a+b, b+c$ and $c+a$ are three factors of the determinant

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

The other factor in the value of the determinant is

a) 4 b) 2 c) $a+b+c$ d) None of these

93. If one root of determinant $\begin{vmatrix} x & 3 & 7 \\ 2 & x & 2 \\ 7 & 6 & x \end{vmatrix} = 0$, is$-9$, then the other two roots are

a) 2,7 b) 2,-7 c) -2,7 d) -2,-7

94. The value of the determinant $\begin{vmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 3 & 4 \\ 1 & 3 & 6 & 10 \\ 1 & 4 & 10 & 20 \end{vmatrix}$ is equal to

a) 0 b) -1 c) 1 d) 10

95. Determinant $\begin{vmatrix} 1/a & a^2 & bc \\ 1/b & b^2 & ca \\ 1/c & c^2 & ab \end{vmatrix}$ is equal to

a) abc b) $\frac{1}{abc}$ c) $ab+bc+ca$ d) 0

96. If $a \neq 0, b \neq 0, c \neq 0$, then $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$ is equal to

a) abc b) $abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$ c) 0 d) $1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}$

97. If $\begin{vmatrix} x+a & b & c \\ a & x+b & c \\ a & b & x+c \end{vmatrix} = 0$, then x equals

a) $a+b+c$ b) $-(a+b+c)$ c) $0, a+b+c$ d) $0, -(a+b+c)$

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

a) $2\sum_{k=1}^{n} k$ b) $2\sum_{k=1}^{n} k^2$ c) $\frac{1}{2}\sum_{k=1}^{n} k^2$ d) 0

99. If the system of equations $2x+3y+5=0, x+ky+5=0, kx-12y-14=0$ be consistent, then value of k is

a) $-2,\frac{12}{5}$ b) $-1,\frac{1}{5}$ c) $-6,\frac{17}{5}$ d) $6,-\frac{12}{5}$

100. If $f(x)=\begin{vmatrix} x-3 & 2x^2-18 & 3x^3-81 \\ x-5 & 2x^2-50 & 4x^3-500 \\ 1 & 2 & 3 \end{vmatrix}$,then

$f(1).f(3)+f(3).f(5)+f(5).f(1)$ is equal to

a) $f(1)$ b) $f(3)$ c) $f(1)+f(3)$ d) $f(1)+f(5)$

101. If a,b,c, are in A.P., then the value of

$\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix}$, is

a) 3 b) -3 c) 0 d) None of these

102. Let $[x]$ represent the greatest integer less than or equal to x, then the value of the determinant

$\begin{vmatrix} [e] & [\pi] & [\pi^2-6] \\ [\pi] & [\pi^2-6] & [e] \\ [\pi^2-6] & [e] & [\pi] \end{vmatrix}$ is

a) -8 b) 8 c) 10 d) None of these

103. If α,β,γ are the cube roots of unity, then the value of the

determinant $\begin{vmatrix} e^\alpha & e^{2\alpha} & (e^{3\alpha}-1) \\ e^\beta & e^{2\beta} & (e^{3\beta}-1) \\ e^\gamma & e^{2\gamma} & (e^{3\gamma}-1) \end{vmatrix}$ is equal to

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

104. If $\Delta=\begin{vmatrix} 1 & 2 & 3 \\ 2 & 5 & 7 \\ 3 & 9 & 13 \end{vmatrix}$ and $\Delta'=\begin{vmatrix} 7 & 20 & 29 \\ 2 & 5 & 7 \\ 3 & 9 & 13 \end{vmatrix}$, then

a) $\Delta'=3\Delta$ b) $\Delta'=\frac{3}{\Delta}$ c) $\Delta'=\Delta$ d) $\Delta'=2\Delta$

105. The coefficient of x in $f(x)=\begin{vmatrix} x & 1+\sin x & \cos x \\ 1 & \log(1+x) & 2 \\ x^2 & 1+x^2 & 0 \end{vmatrix}$, $-1<x\le 1$, is

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

106. l,m,n are the pth, qth and rth terms of an GP and all

Positive, then $\begin{vmatrix} \log l & p & 1 \\ \log m & q & 1 \\ \log n & r & 1 \end{vmatrix}$ equals

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

107. The arbitrary constant on which the value of the determinant $\begin{vmatrix} 1 & \alpha & \alpha^2 \\ \cos(p-d)a & \cos pa & \cos(p-d)a \\ \sin(p-d)a & \sin pa & \sin(p-d)a \end{vmatrix}$ does

not depend, is

a) α b) p c) d d) a

108. If $a_1, a_2, \dots\dots, a_n, \dots$ ....are in GP and $a_i>0$ for each i, then the determinant

$\Delta=\begin{vmatrix} \log a_n & \log a_{n+2} & \log a_{n+4} \\ \log a_{n+6} & \log a_{n+8} & \log a_{n+10} \\ \log a_{n+12} & \log a_{n+14} & \log a_{n+16} \end{vmatrix}$ is equal to

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

109. The minors of-4 and 9 and the cofactors of-4 and 9 in matrix $\begin{bmatrix} -1 & -2 & 3 \\ -4 & -5 & -6 \\ -7 & 8 & 9 \end{bmatrix}$ are respectively

a) $42,3,-42,3$ b) $-42,-3,42,-3$ c) $42,3,-42,-3$ d) $42,3,42,3$

110. The system of equations $3x - 2y + z = 0, \lambda x - 14y + 15z = 0, x + 2y - 3z = 0$ has a solution other than $x = y = z = 0$ then λ is equal to

a) 1 b) 2 c) 3 d) 5

111. If $\begin{vmatrix} a & a+d & a+2\,d \\ a^2 & (a+d)^2 & (a+2\,d)^2 \\ 2a+3\,d & 2(a+d) & 2a+d \end{vmatrix} = 0$, then

a) $d = 0$ b) $a + d = 0$ c) $d = 0$ or $a + d = 0$ d) None of these

112. The value of $\begin{vmatrix} ^{10}C_4 & ^{10}C_5 & ^{11}C_m \\ ^{11}C_6 & ^{11}C_7 & ^{12}C_{m+2} \\ ^{12}C_8 & ^{12}C_9 & ^{13}C_{m+4} \end{vmatrix} = 0$, when m is equal to

a) 6 b) 5 c) 4 d) 1

113. If $\begin{vmatrix} -12 & 0 & \lambda \\ 0 & 2 & -1 \\ 2 & 1 & 15 \end{vmatrix} = -360$, then the value of λ is

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

114. If $f(x) = \begin{vmatrix} 1 & 1 & 1 \\ 2x & (x-1) & x \\ 3x(x-1) & (x-1)(x-2) & x(x-1) \end{vmatrix}$, then $f(50)$ is equal to

a) 0 b) 1 c) 100 d) -100

115. $\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix} = 0$,then a, b, c are

a) In GP b) In HP c) Equal d) In AP

116. The value of $\begin{vmatrix} x & p & q \\ p & x & q \\ p & q & x \end{vmatrix}$ is

a) $x(x-p)(x-q)$ b) $(x-p)(x-q)(x+p+q)$
c) $(p-q)(x-q)(x-p)$ d) $pq(x-p)(x-q)$

117. The value of $\begin{vmatrix} 1 & 1 & 1 \\ bc & ca & ab \\ b+c & c+a & a+b \end{vmatrix}$ is

a) 1 b) 0 c) $(a-b)(b-c)(c-a)$ d) $(a+b)(b+c)(c+a)$

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

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

119. If A, B, C are the angles of a triangle, then the value of

$\Delta = \begin{vmatrix} -1 & \cos C & \cos B \\ \cos C & -1 & \cos A \\ \cos B & \cos A & -1 \end{vmatrix}$ is

a) $\cos A \cos B \cos C$ b) $\sin A \sin B \sin C$ c) 0 d) None of these

120. The matrix $\begin{bmatrix} \lambda & 1 & 0 \\ 0 & 2 & 3 \\ 0 & 0 & \lambda \end{bmatrix}$ is non- singular

a) For all real values of λ b) Only when $\lambda = \pm\frac{1}{\sqrt{2}}$ c) Only when $\lambda \neq 0$ d) Only when $\lambda = 0$

121. One root of the equation $\begin{vmatrix} x & -6 & -1 \\ 2 & -3x & x-3 \\ -3 & 2x & x+2 \end{vmatrix} = 0$ is

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

122. If $ab + bc + ca = 0$ and $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0$, then one of the value of x is

a) $(a^2+b^2+c^2)^{1/2}$
b) $\left[\frac{3}{2}(a^2+b^2+c^2)\right]^{1/2}$
c) $\left[\frac{1}{2}(a^2+b^2+c^2)\right]^{1/2}$
d) None of these

123. If $\begin{vmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{vmatrix}=0$, then x is equal to

a) $0, 2a$
b) $a, 2a$
c) $0, 3a$
d) None of these

124. If α, β, γ are the cube roots of 8, then $\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix}=$

a) 0
b) 1
c) 8
d) 2

125. If A, B and C are the angles of a triangle and
$\begin{vmatrix} 1 & 1 & 1 \\ 1+\sin A & 1+\sin B & \sin C \\ \sin A+\sin^2 A & \sin B+\sin^2 B & \sin C+\sin^2 C \end{vmatrix}=0$
then the triangle must be

a) Equilateral
b) Isosceles
c) Any triangle
d) Right angled

126. If $\omega$is imaginary root of unity, then the value of
$\begin{vmatrix} a & b\omega^2 & a\omega \\ b\omega & c & b\omega^2 \\ c\omega^2 & a\omega & c \end{vmatrix}$ is

a) $a^3+b^3+c^3$
b) a^2b-b^2c
c) 0
d) $a^3+b^3+c^3-3abc$

127. A root of the equation $\begin{vmatrix} 3-x & -6 & 3 \\ -6 & 3-x & 3 \\ 3 & 3 & -6-x \end{vmatrix}=0$, is

a) 6
b) 3
c) 0
d) None of these

128. Determinant $\begin{vmatrix} b^2-ab & b-c & bc-ac \\ ab-a^2 & a-b & b^2-ab \\ bc-ac & c-a & ab-a^2 \end{vmatrix}$ is equal to

a) $abc(a+b+c)$
b) $3a^2b^2c^2$
c) 0
d) None of these

129. $\begin{vmatrix} 1 & 5 & \pi \\ \log_e e & 5 & \sqrt{5} \\ \log_{10} 10 & 5 & e \end{vmatrix}$ is equal to

a) $\sqrt{\pi}$
b) e
c) 1
d) 0

130. The value of the determinant $\begin{vmatrix} x & a & b+c \\ x & b & c+a \\ x & c & a+b \end{vmatrix}=0$, if

a) $x=a$
b) $x=b$
c) $x=c$
d) x has any value

131. If $A=\begin{bmatrix} 3 & 2 & 4 \\ 1 & 2 & 1 \\ 3 & 2 & 6 \end{bmatrix}$and $A_{ij}$are the cofactors of a_{ij}, then
$a_{11}A_{11}+a_{12}A+a_{13}A_{13}$is equal to

a) 8
b) 6
c) 4
d) 0

132. $\begin{vmatrix} 1 & 2 & 3 \\ 1^3 & 2^3 & 3^3 \\ 1^5 & 2^5 & 3^5 \end{vmatrix}$ is equal to

a) 1! 213
b) 1! 3! 5!
c) 6!
d) 9!

133. In the determinant $\begin{vmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ 2 & -3 & 0 \end{vmatrix}$, the value of cofactor to its minor of the element -3 is

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

134. The value of $\begin{vmatrix} 11 & 12 & 13 \\ 12 & 13 & 14 \\ 13 & 14 & 15 \end{vmatrix}$, is

a) 1 b) 0 c) -1 d) 67

135. For positive numbers x, y, z (other than unity) the numerical value of the determinant $\begin{vmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 3 & \log_y z \\ \log_z x & \log_z y & 5 \end{vmatrix}$, is

a) 0 b) $\log x \log y \log z$ c) 1 d) 8

136. If $\begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0$ and x, y, z are all distinct, then xyz is equal to

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

137. The roots of the equation $\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 5 \\ 1 & 2x & 5x^2 \end{vmatrix} = 0$ are

a) $-1, -2$ b) $-1, 2$ c) $1, -2$ d) $1, 2$

138. The value of $\begin{vmatrix} a^2 & b^2 & c^2 \\ (a+1)^2 & (b+1)^2 & (c+1)^2 \\ (a-1)^2 & (b-1)^2 & (c-1)^2 \end{vmatrix}$ is

a) $4\begin{vmatrix} a^2 & b^2 & c^2 \\ a & b & c \\ 1 & 1 & 1 \end{vmatrix}$ b) $3\begin{vmatrix} a^2 & b^2 & c^2 \\ a & b & c \\ 1 & 1 & 1 \end{vmatrix}$ c) $2\begin{vmatrix} a^2 & b^2 & c^2 \\ a & b & c \\ 1 & 1 & 1 \end{vmatrix}$ d) None of these

139. If $\begin{vmatrix} x^n & x^{n+2} & x^{n+3} \\ y^n & y^{n+2} & y^{n+3} \\ z^n & z^{n+2} & z^{n+3} \end{vmatrix} = (y-z)(z-x)(x-y)$ $\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$, then n is equal to

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

140. The value of the determinant $\begin{vmatrix} 15! & 16! & 17! \\ 16! & 17! & 18! \\ 17! & 18! & 19! \end{vmatrix}$ is equal to

a) $15! + 16!$ b) $2(15!)(16!)(17!)$ c) $15! + 16! + 17!$ d) $16! + 17!$

141. If B is a non-singular matrix and A is a square matrix such that $B^{-1}AB$ exists, then det $(B^{-1}AB)$ is equal to

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

142. The value of $\begin{vmatrix} a & a^2-bc & 1 \\ b & b^2-ca & 1 \\ c & c^2-ab & 1 \end{vmatrix}$, is

a) 1 b) -1 c) 0 d) $-abc$

143. If A, B, C be the angles of a triangle, then $\begin{vmatrix} -1 & \cos C & \cos B \\ \cos C & -1 & \cos A \\ \cos B & \cos A & -1 \end{vmatrix}$ is equal to

a) 1 b) 0 c) $\cos A \cos B \cos C$ d) $\cos A + \cos B \cos C$

144. The value of $\begin{vmatrix} \cos(x-a) & \cos(x+a) & \cos x \\ \sin(x+a) & \sin(x-a) & \sin x \\ \cos a \tan x & \cos a \cot x & \operatorname{cosec} 2x \end{vmatrix}$ is equal

a) 1 b) $\sin a \cos a$ c) 0 d) $\sin x \cos x$

145. If a square matrix A is such that $AA^T = I = A^T A$ then $|A|$ is equal to

a) 0 b) ± 1 c) ± 2 d) None of these

146. Let a, b, c be such that $(b+c) \neq 0$ and

$\begin{vmatrix} a & a+1 & a-1 \\ -b & b+1 & b-1 \\ c & c-1 & c+1 \end{vmatrix}$

$$+\begin{vmatrix} a+1 & b+1 & c-1 \\ a-1 & b-1 & c+1 \\ (-1)^{n+2}a & (-1)^{n+1}b & (-1)^{n}c \end{vmatrix}^{1} = 0$$

Then the value of n is

a) Zero b) Any even integer c) Any odd integer d) Any integer

147. If $A=\begin{bmatrix} 3 & 5 \\ 2 & 0 \end{bmatrix}$ and $B=\begin{bmatrix} 1 & 17 \\ 0 & -10 \end{bmatrix}$, then $|AB|$ is equal to

a) 80 b) 100 c) -110 d) 92

148. If $\Delta_a=\begin{vmatrix} a-1 & n & 6 \\ (a-1)^2 & 2n^2 & 4n-2 \\ (a-1)^3 & 3n^3 & 3n^2-3n \end{vmatrix}$, then $\sum_{a=1}^{n} \Delta_a$ is equal to

a) 0 b) 1 c) $\left\{\frac{n(n+1)}{2}\right\}\left\{\frac{a(a+1)}{2}\right\}$ d) None of these

149. The roots of the equation $\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 5 \\ 1 & 2x & 5x^2 \end{vmatrix}=0$

a) $-1, -2$ b) $-1, 2$ c) $1, -2$ d) $1, 2$

150. The value of the determinant

$\begin{vmatrix} 1 & \cos(\alpha-\beta) & \cos\alpha \\ \cos(\alpha-\beta) & 1 & \cos\beta \\ \cos\alpha & \cos\beta & 1 \end{vmatrix}$ is

a) 0 b) 1 c) $\alpha^2-\beta^2$ d) $\alpha^2+\beta^2$

151. The matrix $\begin{bmatrix} 5 & 10 & 3 \\ -2 & -4 & 6 \\ -1 & -2 & b \end{bmatrix}$ is a singular matrix, if b is equal to

a) -3 b) 3 c) 0 d) For any value of b

152. The value of the determinant

$\Delta=\begin{vmatrix} \frac{1-a_1^3b_1^3}{1-a_1b_1} & \frac{1-a_1^3b_2^3}{1-a_1b_2} & \frac{1-a_1^3b_3^3}{1-a_1b_3} \\ \frac{1-a_2^3b_1^3}{1-a_2b_1} & \frac{1-a_2^3b_2^3}{1-a_2b_2} & \frac{1-a_2^3b_3^3}{1-a_2b_3} \\ \frac{1-a_3^3b_1^3}{1-a_3b_1} & \frac{1-a_3^3b_2^3}{1-a_3b_2} & \frac{1-a_3^3b_3^3}{1-a_3b_3} \end{vmatrix}$, is

a) 0

b) Dependent only on a_1, a_2, a_3

c) Dependent only on b_1, b_2, b_3

d) Dependent on $a_1, a_2, a_3\ b_1, b_2, b_3$

153. In a ΔABC ,if $\begin{vmatrix} 1 & a & b \\ 1 & c & a \\ 1 & b & c \end{vmatrix}=0$, then $\sin^2 A+\sin^2 B+\sin^2 C$ is equal to

a) $\frac{9}{4}$ b) $\frac{4}{9}$ c) 1 d) $3\sqrt{3}$

154. If $\begin{vmatrix} x & 3 & 6 \\ 3 & 6 & x \\ 6 & x & 3 \end{vmatrix}=\begin{vmatrix} 2 & x & 7 \\ x & 7 & 2 \\ 7 & 2 & x \end{vmatrix}=\begin{bmatrix} 4 & 5 & x \\ 5 & x & 4 \\ x & 4 & 5 \end{bmatrix}=0$,then x is equal to

a) 9 b) -9 c) 0 d) -1

155. If $\Delta_1=\begin{vmatrix} 7 & x & 2 \\ -5 & x+1 & 3 \\ 4 & x & 7 \end{vmatrix}$ and $\Delta_2=\begin{vmatrix} x & 2 & 7 \\ x+1 & 3 & -5 \\ x & 7 & 4 \end{vmatrix}$, then the value of x for which $\Delta_1+\Delta_2=0$, is

a) 2 b) 0 c) Any real number d) None of these

156. Let a, b, c, be positive and not all equal, the value of the

Determinant $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is

a) Positive b) Negative c) Zero d) None of these

157. If $a_i^2+b_i^2+c_i^2=1 (i=1,2,3)$ and $a_ia_j+b_ib_j+c_ic_j=0 (i\neq j$ and $i,j=1,2,3)$, then the value of $\begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix}$ is

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

158. $\begin{vmatrix} 1 & a & a^2-bc \\ 1 & b & b^2-ac \\ 1 & c & c^2-ab \end{vmatrix}$ is equal to

a) 0 b) $a^3+b^3+c^3-3abc$

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

159. $\Delta=\begin{vmatrix} 1/a & 1 & bc \\ 1/b & 1 & ca \\ 1/c & 1 & ab \end{vmatrix}=$

a) 0 b) abc c) $\frac{1}{abc}$ d) None of these

160. The value of the determinant $\begin{vmatrix} y+z & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix}$ is equal to

a) $6xyz$ b) xyz c) $4xyz$ d) $xy+yz+zx$

161. If $f(\alpha)=\begin{vmatrix} 1 & \alpha & \alpha^2 \\ \alpha & \alpha^2 & 1 \\ \alpha^2 & 1 & \alpha \end{vmatrix}$, then $f(\sqrt[3]{3})$ is equal to

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

162. If $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}=5$, then the value of $\begin{vmatrix} b_2c_3-b_3c_2 & c_2a_3-c_3a_2 & a_2b_3-c_3b_2 \\ b_3c_1-b_1c_3 & c_3a_1-c_1a_3 & a_3b_1-a_1b_3 \\ b_1c_2-b_2c_1 & c_1a_2-c_2a_1 & a_1b_2-a_2b_1 \end{vmatrix}$ is

a) 5 b) 25 c) 125 d) 0

163. If a,b and c are all different from zero and $\Delta=\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}=0$, then the value of $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}$ is

a) abc b) $\frac{1}{abc}$ c) $-a-b-c$ d) -1

164. $\begin{vmatrix} \sin^2 x & \cos^2 x & 1 \\ \cos^2 x & \sin^2 x & 1 \\ -10 & 12 & 2 \end{vmatrix}=$

a) 0

b) $12\cos^2 x-10\sin^2 x$

c) $12\sin^2 x-10\cos^2 x-2$

d) $10\sin 2x$

165. If $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix}0$ and vectors $(1,a,a^2),(1,b,b^2)$and $(1,c,c^2)$are non-coplanar, then the product abc equals

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

166. If $\begin{vmatrix} 1+a & 1 & 1 \\ 1+b & 1+2b & 1 \\ 1+c & 1+c & 1+3c \end{vmatrix}=0$, where $a\neq 0, b\neq 0, c\neq 0$, then $a^{-1}+b^{-1}+c^{-1}$ is

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

167. In a $\Delta\, ABC, a,b,c$ are sides and A,B,C are angles opposite to them, then the value of the determinant $\begin{vmatrix} a^2 & b\sin A & c\sin A \\ b\sin A & 1 & \cos A \\ c\sin A & \cos A & 1 \end{vmatrix}$, is

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

168. The solutions of the equation $\begin{vmatrix} x & 2 & -1 \\ 2 & 5 & x \\ -1 & 2 & x \end{vmatrix} = 0$, are

a) $3, -1$ b) $-3, 1$ c) $3, 1$ d) $-3, -1$

169. If $f(x) = \begin{vmatrix} 1 & x & (x+1) \\ 2x & x(x-1) & x(x+1) \\ 3x(x-1) & x(x-1)(x-2) & x(x-1)(x+1) \end{vmatrix}$ then $f(11)$ equals

a) 0 b) 11 c) -11 d) 1

170. Determinant $\begin{vmatrix} b^2+c^2 & a^2 & a^2 \\ b^2 & c^2+a^2 & b^2 \\ c^2 & c^2 & a^2+b^2 \end{vmatrix}$ is equal to

a) abc b) $4\,abc$ c) $4a^2b^2c^2$ d) $a^2b^2c^2$

171. The determinant $\begin{vmatrix} a & b & a\alpha+b \\ b & c & b\alpha+c \\ a\alpha+b & b\alpha+c & 0 \end{vmatrix}$ is equal to zero for all values of α, if

a) a, b, c are in AP b) a, b, c are in GP c) a, b, c are in HP d) None of these

172. The determinant

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

a) α b) β c) α and β d) Neither α nor β

173. the system of simultaneous equations

$kx + 2y - z = 1$

$(k-1)y - 2z = 2$

$(k+2)z = 3$

Have a unique solution if k equals

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

174. If $\alpha, \beta, \gamma \in R$, then the determinant $\Delta = \begin{vmatrix} (e^{i\alpha}+e^{-i\alpha})^2 & (e^{i\alpha}-e^{-i\alpha})^2 & 4 \\ (e^{i\beta}+e^{-i\beta})^2 & (e^{i\beta}-e^{-i\beta})^2 & 4 \\ (e^{i\gamma}+e^{-i\gamma})^2 & (e^{i\gamma}-e^{-i\gamma})^2 & 4 \end{vmatrix}$ is

a) Independent of α, β and γ b) Dependent of α, β and γ

c) Independent of α, β only d) Independent of α, β only

175. If $\begin{vmatrix} 1 & 1 & 0 \\ 2 & 0 & 3 \\ 5 & -6 & x \end{vmatrix} = 29$, then x is

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

176. The value of the determinant

$\begin{vmatrix} 1 & \cos(\beta-\alpha) & \cos(\gamma-\alpha) \\ \cos(\alpha-\beta) & 1 & \cos(\gamma-\beta) \\ \cos(\alpha-\gamma) & \cos(\beta-\gamma) & 1 \end{vmatrix}$ is

a) $4\cos\alpha\cos\beta\cos\gamma$ b) $2\cos\alpha\cos\beta\cos\gamma$ c) $4\sin\alpha\sin\beta\sin\gamma$ d) None of these

177. If $1 + \frac{1}{a} + \frac{1}{c} + \frac{1}{c} = 0$, then $\Delta = \begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$ is equal to

a) 0 b) abc c) $-abc$ d) None of these

178. if $\begin{vmatrix} 1+ax & 1+bx & 1+cx \\ 1+a_1x & 1+b_1x & 1+c_1x \\ 1+a_2x & 1+b_2x & 1+c_2x \end{vmatrix} = A_0 + A_1x + A_2x^2 + A_3x^3$, then A_0 is equal to

a) abc b) 0 c) 1 d) None of these

179. If $\Delta_1 = \begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}$, $\Delta_2 = \begin{vmatrix} 1 & bc & a \\ 1 & ca & b \\ 1 & ab & c \end{vmatrix}$, then

a) $\Delta_1 + \Delta_2 = 0$ b) $\Delta_1 + 2\Delta_2 = 0$ c) $\Delta_1 = \Delta_2$ d) $\Delta_1 = 2\Delta_2$

180. If the system of equations

$bx + ay = c, cx + az = b, cy + bz = a$

has a unique solution, then

a) $abc = 1$ b) $abc = -2$ c) $abc = 0$ d) None of these

181. The number of distinct real root 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

182. A and B are two non-zero square matrices such that $AB = O$. Then,

a) Both A and B are singular
b) Either of them is singular
c) Neither matrix is singular
d) None of these

183. The determinant $\begin{vmatrix} a & b & a\alpha - b \\ b & c & b\alpha - c \\ 2 & 1 & 0 \end{vmatrix}$ vanishes, if

a) a, b, c are in AP b) $\alpha = \frac{1}{2}$ c) a, b, c are in GP d) Both (b) or (c)

184. The value of determinant $\begin{vmatrix} (a^x + a^{-x})^2 & (a^x - a^{-x})^2 & 1 \\ (b^x + b^{-x})^2 & (b^x - b^{-x})^2 & 1 \\ (c^x + c^{-x})^2 & (c^x - c^{-x})^2 & 1 \end{vmatrix}$ is

a) 0 b) $2\ abc$ c) $a^2b^2c^2$ d) None of these

185. If ω is an imaginary cube root of unity, then the value of

$\begin{vmatrix} a & b\omega^2 & a\omega \\ b\omega & c & b\omega^2 \\ c\omega^2 & a\omega & c \end{vmatrix}$, is

a) $a^3 + b^3 + c^3$ b) $a^2b - b^2c$ c) 0 d) $a^3 + b^3 + c^3 - 3abc$

186. If A, b, C are the angles of a triangle, then the determinant

$\Delta = \begin{vmatrix} \sin 2A & \sin C & \sin B \\ \sin C & \sin 2B & \sin A \\ \sin B & \sin A & \sin 2C \end{vmatrix}$ is equal to

a) 1 b) -1 c) $\sin A + \sin B + \sin C$ d) None of these

187. If $n = 3k$ and $1\ \omega, \omega^2$ are the cube roots of unity, then $\Delta = \begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega^{2n} & 1 & \omega^n \\ \omega^n & \omega^{2n} & 1 \end{vmatrix}$ has the value

a) 0 b) ω c) ω^2 d) 1

188. If $f(x) = \begin{vmatrix} 1+a & 1+ax & 1+ax^2 \\ 1+b & 1+bx & 1+bx^2 \\ 1+c & 1+cx & 1+cx^2 \end{vmatrix}$, where a, b, c are non-zero constants, then value of $f(10)$is

a) $10\ (b-a)(c-a)$ b) $100\ (b-a)(c-b)(a-c)$
c) $100\ abc$ d) 0

189. The factors of $\begin{vmatrix} x & a & b \\ a & x & b \\ a & b & x \end{vmatrix}$ are

a) $x - a, x - b$, and $x + a + b$
b) $x + a, x + b$ and $x + a + b$
c) $x + a, x + b$ and $x - a - b$
d) $x - a, x - b$ and $x - a - b$

190. The integer represented by the determinant

$\begin{bmatrix} 215 & 342 & 511 \\ 6 & 7 & 8 \\ 36 & 49 & 54 \end{bmatrix}$ is exactly divisible by

a) 146 b) 21 c) 20 d) 335

191. If x, y, z are different from zero and $\Delta = \begin{vmatrix} a & b-y & c-z \\ a-x & b & c-z \\ a-x & b-y & c \end{vmatrix} = 0$, then the value of expression $\frac{a}{x} + \frac{b}{y} + \frac{c}{z}$ is

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

192. Consider the following statements :

1. The determinants $\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$ and $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$ are not identically equal.

2. For $a > 0, b > 0, c > 0$ the value of the determinant $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is always positive.

3.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 the two triangles with vertices $(x_1, y_1), (x_2, y_2), (x_3, y_3)$ and $(a_1, b_1), (a_2, b_2), (b_3, b_3)$ must be congruent. Which of the statement given above is/are correct?

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

193. If $x = -5$ is a root of $\begin{vmatrix} 2x+1 & 4 & 8 \\ 2 & 2x & 2 \\ 7 & 6 & 2x \end{vmatrix} = 0$, then the other roots are

a) 3, 3, 5 b) 1, 3, 5 c) 1, 7 d) 2, 7

194. If A is a square matrix of order n such that its elements are polynomial in x and its r-rows become identical for $x = k$, then

a) $(x-k)^r$ is a factor of $|A|$

b) $(x-k)^{r-1}$ is a factor of $|A|$

c) $(x-k)^{r+1}$ is a factor $|A|$

d) $(x-k)^r$ is a factor of A

195. The value of the determinant $\begin{vmatrix} 10! & 11! & 12! \\ 11! & 12! & 13! \\ 12! & 13! & 14! \end{vmatrix}$ is

a) $2(10!\,11!)$ b) $2(10!\,13!)$ c) $2(10!\,11!\,12!)$ d) $2(11!\,12!\,13!)$

196. If $\begin{vmatrix} b+c & c+a & a+b \\ a+b & b+c & c+a \\ c+a & a+b & b+c \end{vmatrix} = k \begin{vmatrix} a & b & c \\ c & a & b \\ d & c & a \end{vmatrix}$, then the value of k, is

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

197. If $(\omega \neq 1)$ is a cubic root of unity, then

$\begin{vmatrix} 1 & 1+i+\omega^2 & \omega^2 \\ 1-i & -1 & \omega^2-1 \\ -i & -1+\omega-i & -1 \end{vmatrix}$

a) zero b) 1 c) i d) ω

198. If $\begin{vmatrix} x+1 & x+2 & x+3 \\ x+2 & x+3 & x+4 \\ x+a & x+b & x+c \end{vmatrix} = 0$ then a, b, c are in

a) AP b) HP c) GP d) None of these

199. $\begin{vmatrix} b^2c^2 & bc & b+c \\ c^2a^2 & ca & c+a \\ a^2b^2 & ab & a+b \end{vmatrix}$ is equal to

a) $\frac{1}{abc}(ab+bc+ca)$ b) $ab+bc+ca$ c) 0 d) $a+b+c$

200. The value of the determinant $\Delta = \begin{vmatrix} 2a_1b_1 & a_1b_2+a_2b_1 & a_1b_3+a_3b_1 \\ a_1b_2+a_2b_1 & 2a_2b_2 & a_2b_3+a_3b_2 \\ a_1b_3+a_3b_1 & a_3b_2+a_2b_3 & 2a_3b_3 \end{vmatrix}$ is

a) 1 b) $2a_1a_2a_3b_1b_2b_3$ c) 0 d) $a_1a_2a_3b_1b_2b_3$

201. If the system of equations $x+ky-z=0, 3x-ky-z=0$ and $x-3y+z=0$ has non-zero solution then k is equal to

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

202. The value of the determinant $\begin{vmatrix} 1 & \omega^3 & \omega^5 \\ \omega^3 & 1 & \omega^4 \\ \omega^5 & \omega^4 & 1 \end{vmatrix}$, where ω is an imaginary cube root of unity, is

a) $(1-\omega)^2$ b) 3 c) -3 d) None of these

203. If $f(x) = \begin{vmatrix} a & -1 & 0 \\ ax & a & -1 \\ ax^2 & ax & a \end{vmatrix}$, then $f(2x)-f(x)$ is equal to

a) ax b) $ax(2a+3x)$ c) $ax(2+3x)$ d) None of these

204. Coefficient of x in

$f(x) = \begin{vmatrix} x & (1+\sin x)^2 & \cos x \\ 1 & \log(1+x) & 2 \\ x^2 & (1+x)^2 & 0 \end{vmatrix}$, is

a) 0
b) 1
c) -2
d) Cannot be determined

205. If $f(x) = \begin{vmatrix} \sin x & \cos x & \tan x \\ x^3 & x^2 & x \\ 2x & 1 & 1 \end{vmatrix}$, then $\lim_{n\to 0} \frac{f(x)}{x^2}$, is

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

206. 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 is equal to

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

207. If the matrix M_r is given by

$M_r = \begin{bmatrix} r & r-1 \\ r-1 & r \end{bmatrix}$, $= 1,2,3, \ldots$, then the value of det $(M_1) + \det(M_2) + \ldots + \det(M_{2008})$ is

a) 2007 b) 2008 c) $(2008)^2$ d) $(2007)^2$

208. The coefficient of x in $f(x) = \begin{vmatrix} x & 1+\sin x & \cos x \\ 1 & \log(1+x) & 2 \\ x^2 & 1+x^2 & 0 \end{vmatrix}$, $-1 < x \le 1$, is

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

209. Let $ax^6+bx^5+cx^4+dx^3+ex^2+fx+g = \begin{vmatrix} (x+1) & (x^2+2) & (x^2+x) \\ (x^2+x) & (x^2+1) & (x^2+2) \\ (x^2+2) & (x^2+x) & (x+1) \end{vmatrix}$. Then,

a) $f=3, g=-5$ b) $f=-3, g=-5$ c) $f=-3, g=-9$ d) None of these

210. 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

211. If $A = \begin{vmatrix} 1 & 0 & 0 \\ x & 1 & 0 \\ x & x & 1 \end{vmatrix}$ and $I = \begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$, then

$A^3 - 4A^2 + 3A + I$ is equal to

a) $3I$ b) I c) $-I$ d) $-2I$

212. 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

213. If $0 \le [x] < 2, -1 \le [y] < 1$ and $1 \le [z] < 3, [\cdot]$ denotes the greatest integer function, then the maximum value of the determinant

$\Delta = \begin{vmatrix} [x]+1 & [y] & [z] \\ [x] & [y]+1 & [z] \\ [x] & [y] & [z]+1 \end{vmatrix}$, is

a) 2 b) 6 c) 4 d) None of these

214. If A, B and C are the 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 the triangle ABC is

a) Isosceles b) Equilateral c) Right angled isosceles d) None of these

215. The system of equations

$kx + y + z = 1$

$x + ky + z = k$

$x + y + kz = k^2$

have no solution, if k equals

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

216. If $a, b. c$ are in AP, then the value of $\begin{vmatrix} x+2 & x+3 & x+a \\ x+4 & x+5 & x+b \\ x+6 & x+7 & x+c \end{vmatrix}$ is

a) $x-(a+b+c)$ b) $9x^2+a+b+c$ c) $a+b+c$ d) 0

217. If the value of the determinant $\begin{vmatrix} a & 1 & 1 \\ 1 & b & 1 \\ 1 & 1 & c \end{vmatrix}$ is positive, then

a) $abc > 1$ b) $abc > -8$ c) $abc < -8$ d) $abc > -2$

218. If $a+b+c=0$, then the solution of the equation $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0$ is

a) 0

b) $\pm\frac{3}{2}(a^2+b^2+c^2)$

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

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

219. If $\Delta = \begin{vmatrix} 3 & 4 & 5 & x \\ 4 & 5 & 6 & y \\ 5 & 6 & 7 & z \\ x & y & z & 0 \end{vmatrix}$, then Δ equals

a) $(y-2z+3x)^2$

b) $(x-2y+z)^2$

c) $(x+y+z)^2$

d) $x^2+y^2+z^2-xy-yz-zx$

220. If $a \ne p, b \ne q, c \ne r$ and $\begin{vmatrix} p & b & c \\ a & q & c \\ a & b & r \end{vmatrix} = 0$, then the value of $\frac{p}{p-a}+\frac{q}{q-b}+\frac{r}{r-c}$ is

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

221. If α, β are non-real numbers satisfying $x^3-1=0$, then the value of $\begin{vmatrix} \lambda+1 & \alpha & \beta \\ \alpha & \lambda+\beta & 1 \\ \beta & 1 & \lambda+\alpha \end{vmatrix}$ is equal to

a) 0 b) λ^3 c) λ^3+1 d) λ^3-1

222. The system of linear equations

$x+y+z=2$

$2x+y-z=3$

$3x+2y+kz=4$

Has a unique solution, is

a) $k \neq 0$ b) $-1<k<1$ c) $-2<k<2$ d) $k=0$

223. $\Delta=\begin{vmatrix} a & a+b & a+b+c \\ 3a & 4a+3b & 5a+4b+3c \\ 6a & 9a+6b & 11a+9b+6c \end{vmatrix}$, where $a=i, b=\omega, c=\omega^2$, then Δ is equal to

a) i b) $-\omega^2$ c) ω d) $-i$

224. If $D_r=\begin{vmatrix} 2^{r-1} & 3^{r-1} & 4^{r-1} \\ x & y & z \\ 2^n-1 & (3^n-1)/2 & (4^n-1)/3 \end{vmatrix}$, then the value of $\sum_{r=1}^{n} D_r$ is equal to

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

225. If $\begin{vmatrix} -12 & 0 & \lambda \\ 0 & 2 & -1 \\ 2 & 1 & 15 \end{vmatrix}=-360$, then the value of λ, is

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

226. if x, y, z are in A.P., then the value of the $\det(A)$ is, where

$A=\begin{bmatrix} 4 & 5 & 6 & x \\ 5 & 6 & 7 & y \\ 6 & 7 & 8 & z \\ x & y & z & 0 \end{bmatrix}$

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

227. $\begin{vmatrix} 1+\sin^2\theta & \sin^2\theta & \sin^2\theta \\ \cos^2\theta & 1+\cos^2\theta & \cos^2\theta \\ 4\sin 4\theta & 4\sin 4\theta & 1+4\sin 4\theta \end{vmatrix}=0$, then $\sin 4\theta$ equals to

a) $1/2$ b) 1 c) $-1/2$ d) -1

228. If $C=2\cos\theta$, then the value of the determinant $\Delta=\begin{vmatrix} C & 1 & 0 \\ 1 & C & 1 \\ 6 & 1 & C \end{vmatrix}$ is

a) $\dfrac{\sin 4\theta}{\sin\theta}$ b) $\dfrac{2\sin^2 2\theta}{\sin\theta}$ c) $4\cos^2\theta(2\cos\theta-1)$ d) None of these

229. **If $\begin{vmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{vmatrix}=0$, then x is equal to**

a) $0, 2a$ b) $a, 2a$ c) $0, 3a$ d) None of these

230. If a, b, c are the positive integers, then the determinant $\Delta=\begin{vmatrix} a^2+x & ab & ac \\ ab & b^2+x & bc \\ ac & bc & c^2+x \end{vmatrix}$ is divisible by

a) x^3 b) x^2 c) $(a^2+b^2+c^2)$ d) None of these

231. The value of $\begin{vmatrix} x+y & y+z & z+x \\ x & y & z \\ x-y & y-z & z-x \end{vmatrix}$ is equal to

a) $2(x+y+z)^2$ b) $2(x+y+z)^3$ c) $(x+y+z)^3$ d) 0

232. The roots of the equation $\begin{vmatrix} x-1 & 1 & 1 \\ 1 & x-1 & 1 \\ 1 & 1 & x-1 \end{vmatrix}=0$, are

a) 1, 2 b) $-1, 2$ c) $1, -2$ d) $-1, -2$

233. Let a, b, c be positive real numbers. The following system of equations in x, y and z

$\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}=1, \frac{x^2}{a^2}-\frac{y^2}{b^2}+\frac{z^2}{c^2}=1, -\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ has

a) No solution

b) Unique solution

c) Infinitely many solutions

d) Finitely many solutions

234. The determinant $\begin{vmatrix} \cos C & \tan A & 0 \\ \sin B & 0 & -\tan A \\ 0 & \sin B & \cos C \end{vmatrix}$ has the value, where A, B, C are angles of a triangle

a) 0 b) 1 c) $\sin A \sin B$ d) $\cos A \cos B \cos C$

235. In the interval $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$, the number of real solutions of the equations $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$ is

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

236. Determinant $\begin{vmatrix} 1 & x & y \\ 2 & \sin x + 2x & \sin y + 3y \\ 3 & \cos x + 3x & \cos y + 3y \end{vmatrix}$ is equal to

a) $\sin(x-y)$ b) $\cos(x-y)$ c) $\cos(x+y)$ d) $xy(\sin(x-y)$

237. ω is an imaginary cube root of unity and $\begin{vmatrix} x+\omega^2 & \omega & 1 \\ \omega & \omega^2 & 1+x \\ 1 & x+\omega & \omega^2 \end{vmatrix} = 0$, then one of the value of x is

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

238. If $\begin{vmatrix} y+z & x & y \\ z+x & z & x \\ x+y & y & z \end{vmatrix} = k(x+y+z)(x-z)^2$, then k is equal to

a) $2xyz$ b) 1 c) xyz d) $x^2y^2z^2$

239. If $f(x) = \begin{vmatrix} 1 & 2(x-1) & 3(x-1)(x-2) \\ x-1 & (x-1)(x-2) & (x-1)(x-2)(x-3) \\ x & x(x-1) & x(x-1)(x-2) \end{vmatrix}$

Then, the value of $f(49)$ is

a) $49x$ b) $-49x$ c) 0 d) 1

240. The determinant $\Delta = \begin{vmatrix} b & c & b\alpha + c \\ c & d & c\alpha + d \\ b\alpha + c & c\alpha + d & a\alpha^3 - c\alpha \end{vmatrix}$ is equal to zero, if

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

b) b, c, d are in G.P.

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

d) α is a root of $ax^3 + bx^2 - cx - d = 0$

241. $\begin{vmatrix} \log e & \log e^2 & \log e^3 \\ \log e^2 & \log e^3 & \log e^4 \\ \log e^3 & \log e^4 & \log e^5 \end{vmatrix}$ is equal to

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

242. If $f(\theta) = \begin{vmatrix} \cos^2\theta & \cos\theta\sin\theta & -\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta & \cos\theta \\ \sin\theta & -\cos\theta & 0 \end{vmatrix}$. Then, for all θ

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

243. Let $A = \begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$, where $0 \le \theta \le 2\pi$, then the range of o$|A|$ is

a) $(2, 4)$ b) $[2, 4]$ c) $[2, 4)$ d) All of these

244. The value of $\begin{vmatrix} \log_3 512 & \log_4 3 \\ \log_3 8 & \log_4 9 \end{vmatrix} \times \begin{vmatrix} \log_2 3 & \log_8 3 \\ \log_3 4 & \log_3 4 \end{vmatrix}$ is

a) 7 b) 10 c) 13 d) 17

245. If $\begin{vmatrix} x^2+x & x+1 & x-2 \\ 2x^2+3x-1 & 3x & 3x-3 \\ x^2+2x+3 & 2x-1 & 2x-1 \end{vmatrix} = Ax - 12$, then the value of A is

a) 12 b) 23 c) -12 d) 24

246. One factor of $\begin{vmatrix} a^2+x & ab & ac \\ ab & b^2+x & cb \\ ca & cb & c^2+x \end{vmatrix}$ is

a) x^2

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

c) $\frac{1}{x}$

d) None of these

247. If $\begin{vmatrix} a^2 & b^2 & c^2 \\ (a+1)^2 & (b+1)^2 & (c+1)^2 \\ (a-1)^2 & (b-1)^2 & (c-1)^2 \end{vmatrix} = k \begin{vmatrix} a^2 & b^2 & c^2 \\ a & b & c \\ 1 & 1 & 1 \end{vmatrix}$,

Then the value of k is

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

248. For positive numbers x, y and z, the numerical value of the determinant $\begin{vmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 1 & \log_y z \\ \log_z x & \log_z y & 1 \end{vmatrix}$ is

a) 0 b) 1 c) $\log_e xyz$ d) None of these

249. If the system of equations

$x + a\,y + a\,z = 0$

$b\,x + y + b\,z = 0$

$c\,x + c\,y + z = 0$

Where a, b and c are non-zero non-unity, has a non-trivial solution, then the value of $\frac{a}{1-a} + \frac{b}{1-b} + \frac{c}{1-c}$ is

a) 0 b) 1 c) -1 d) $\frac{abc}{a^2+b^2+c^2}$

250. The value of the determinant $\begin{vmatrix} bc & ca & ab \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix}$, where a, b, c are the p^{th}, q^{th} and r^{th} terms of a H.P., is

a) $p+q+r$ b) $(a+b+c)$ c) 1 d) None of these

251. The value of λ, if $ax^4 + bx^3 + cx^2 + 50x + d = \begin{vmatrix} x^3-14x^2 & -x & 3x+\lambda \\ 4x+1 & 3x & x-4 \\ -3 & 4 & 0 \end{vmatrix}$, is

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

252. 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) $x = c$

253. If the equations $2x + 3y + 1 = 0, 3x + y - 2 = 0$ and $ax + 2y - b = 0$ are consistent, then

a) $a - b = 2$ b) $a + b + 1 = 0$ c) $a + b = 3$ d) $a - b - 8 = 0$

254. If $a^{-1} + b^{-1} + c^{-1} = 0$ such that $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = \lambda$ then value of λ is

a) 0 b) abc c) $-abc$ d) None of these

255. If a, b, c, d, e and f are in GP, then the value of

$\begin{vmatrix} a^2 & d^2 & x \\ b^2 & e^2 & y \\ c^2 & f^2 & z \end{vmatrix}$

a) Depends on x and y b) Depends on x and z

c) Depends on y and z d) independents on x, y and z

256. The values of x for which the given matrix

$\begin{bmatrix} -x & x & 2 \\ 2 & x & -x \\ x & -2 & -x \end{bmatrix}$ will be non-singular, are

a) $-2 \le x \le 2$ b) For all x other then 2 and -2
c) $x \ge 2$ d) $x \le -2$

257. The roots of the equation

$$\begin{vmatrix} 3x^2 & x^2 + x\cos\theta + \cos^2\theta & x^2 + x\sin\theta + \sin^2\theta \\ x^2 + x\cos\theta + \cos^2\theta & 3\cos^2\theta & 1 + \frac{\sin 2\theta}{2} \\ x^2 + x\sin\theta + \sin^2\theta & 1 + \frac{\sin 2\theta}{2} & 3\sin^2\theta \end{vmatrix} = 0$$

a) $\sin\theta, \cos\theta$ b) $\sin^2\theta, \cos^2\theta$ c) $\sin\theta, \cos^2\theta$ d) $\sin^2\theta, \cos\theta$

258. If $a > 0, b > 0, c > 0$ are respectively the p^{th}, q^{th}, r^{th} terms of a GP, then the value of the determinant

$\begin{vmatrix} \log a & p & 1 \\ \log b & q & 1 \\ \log c & r & 1 \end{vmatrix}$, is

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

259. If $c = 2\cos\theta$, then the 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

260. The value of $\Delta = \begin{vmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{vmatrix}$, is

a) 8 b) -8 c) 400 d) 1

261. The value of the determinant $\begin{vmatrix} a^2 & a & 1 \\ \cos(nx) & \cos(n+1)x & \cos(n+2)x \\ \sin(nx) & \sin(n+1)x & \sin(n+2)x \end{vmatrix}$ is independent of

a) n b) a c) x d) None of these

262. Let $[x]$ represent the greatest integer less than or equal to x, then the value of the determinant

$\begin{vmatrix} [e] & [\pi] & [\pi^2 - 6] \\ [\pi] & [\pi^2 - 6] & [e] \\ [\pi^2 - 6] & [e] & [\pi] \end{vmatrix}$ is

a) -8 b) 8 c) 10 d) None of these

263. $\begin{vmatrix} 1 + ax & 1 + bx & 1 + cx \\ 1 + a_1x & 1 + b_1x & 1 + c_1x \\ 1 + a_2x & 1 + b_2x & 1 + c_2x \end{vmatrix} = A_0 + A_1x + A_2x^2 + A_3x^3$, then A_1 is equal to

a) abc b) 0 c) 1 d) None of these

264. If ω is a complex cube root of unity, then

$\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix}$ is equal to

a) -1 b) 1 c) 0 d) ω

265. If all the elements in a square matrix A of order 3 are equal to 1 or -1, then $|A|$, is

a) An odd number b) An even number c) An imaginary number d) A real number

266. Let $\Delta = \begin{vmatrix} 1 + x_1y_1 & 1 + x_1y_2 & 1 + x_1y_3 \\ 1 + x_2y_1 & 1 + x_2y_2 & 1 + x_2y_3 \\ 1 + x_3y_1 & 1 + x_3y_2 & 1 + x_3y_3 \end{vmatrix}$, then value of Δ is

a) $x_1x_2x_3+y_1y_2y_3$ b) $x_1x_2x_3y_1y_2y_3$
c) $x_2x_3y_2y_3+x_3y_1y_3y_1+x_1x_2y_1y_2$ d) 0

267. In ΔABC if $\begin{vmatrix}1 & a & b\\ 1 & c & a\\ 1 & b & c\end{vmatrix}=0$,then
$\sin^2 A+\sin^2 B+\sin^2 C$ is equal to
a) $\frac{4}{9}$ b) $\frac{9}{4}$ c) $3\sqrt{3}$ d) 1

268. If -9 is a root of the equation $\begin{vmatrix}x & 3 & 7\\ 2 & x & 2\\ 7 & 6 & x\end{vmatrix}=0$, then the other two roots are
a) $2,7$ b) $-2,7$ c) $2,-7$ d) $-2,-7$

269. The value of the determinant $\begin{vmatrix}1 & 1 & 1\\ 1 & 1-x & 1\\ 1 & 1 & 1+y\end{vmatrix}$ is equal to
a) $3-x+y$ b) $(1-x)(1+y)$ c) xy d) $-xy$

270. If $a_1,a_2,\dots,a_n,\dots$, are in GP, then the determinant
$\Delta=\begin{vmatrix}\log a_n & \log a_{n+1} & \log a_{n+2}\\ \log a_{n+3} & \log a_{n+4} & \log a_{n+5}\\ \log a_{n+6} & \log a_{n+7} & \log a_{n+8}\end{vmatrix}$ is equal to
a) 2 b) 4 c) 0 d) 1

271. If x,y,z are different from zero and
$\Delta\begin{vmatrix}a & b-y & c-z\\ a-x & b & c-z\\ a-x & b-y & c\end{vmatrix}=0$, then the value of the expression $\frac{a}{x}+\frac{b}{y}+\frac{c}{z}$ is
a) 0 b) -1 c) 1 d) 2

272. If $A=\begin{vmatrix}a & b & c\\ x & y & z\\ p & q & r\end{vmatrix}$ and $B=\begin{vmatrix}q & -b & y\\ -p & a & -x\\ r & -c & z\end{vmatrix}$, then
a) $A=2B$ b) $A=B$ c) $A=-B$ d) None of these

273. 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
$\frac{p}{p-a}+\frac{q}{q-b}+\frac{r}{r-c}$ is equal to
a) 0 b) 1 c) 2 d) 3

274. Which one of the following is correct?
If A non-singular matrix, then
a) $\det(A^{-1})=\det(A)$ b) $\det(A^{-1})=\frac{1}{\det(A)}$ c) $\det(A^{-1})=1$ d) None of these

275. The determinant $\begin{vmatrix}4+x^2 & -6 & -2\\ -6 & 9+x^2 & 3\\ -2 & 3 & 1+x^2\end{vmatrix}$ is not divisible by
a) x b) x^3 c) $14+x^2$ d) x^5

276. If $\begin{bmatrix}1 & 2 & x\\ 4 & -1 & 7\\ 2 & 4 & -6\end{bmatrix}$ is a singular matrix, then x is equal to
a) 0 b) 1 c) -3 d) 3

277. If $\begin{vmatrix}a & b & 0\\ 0 & a & b\\ b & 0 & a\end{vmatrix}=0$, then
a) a is one of the cube roots of unity b) b is one of the cube roots of unity
c) $\left(\frac{a}{b}\right)$ is one of the cube roots of unity d) $\left(\frac{a}{b}\right)$ is one of the cube roots of -1

278. $\begin{vmatrix} a+b+2c & a & b \\ c & 2a+b+c & b \\ c & a & a+2b+c \end{vmatrix}$ is equal to

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