DETERMINANTS T2

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

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

52. 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

53. 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

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

a) $a(x+y+z)+b(p+q+r)+c$ b) 0

c) $abc+xyz+ppr$ d) None of the above

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

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

56. 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

57. 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

58. 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) $0, -(a+b+c)$

59. 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

60. 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

61. 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

62. 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) $\mathrm{Det}\,(A) = 0$　　b) $\mathrm{Det}\,(A) \in (-\infty, 0)$　　c) $\mathrm{Det}\,(A) \in [2,4]$　　d) $\mathrm{Det}\,(A) \in [-2, \infty)$

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

a) $\sqrt{\pi}$　　b) e　　c) 1　　d) 0

64. 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

65. 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

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

a) 0　　b) 30^x　　c) 30^{-x}　　d) 1

67. 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

68. If $a \ne 0$, $b \ne 0$, $c \ne 0$, 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) $1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c}$

69. 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

70. 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

71. 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

72. 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

73. 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

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

a) 0

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

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

d) $10\sin 2x$

75. 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

76. 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

77. 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)

78. 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) $-2, -7$

79. 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

80. 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) $-1, -2$

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

a) $1!\,2!\,3!$ b) $1!\,3!\,5!$ c) $6!$ d) $9!$

82. 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

83. 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

84. 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) $\cos A + \cos B \cos C$

85. 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

86. 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

87. 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) $-2I$

88. 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) $xy(\sin(x-y)$

89. 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

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

91. 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

92. 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

93. 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

94. 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

95. 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) $-2,-7$

96. 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

97. If $D=\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix}$ for $x \ne 0, y \ne 0$, 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

98. 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

99. 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

100. 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