MATHS

61. Number of solutions of $\left|x^2 - 3|x| + 2\right| = 0.15$ is

1) 8 2) 6 3) 4 4) 2

62. If $A = \begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$, then det(adj(adj A)) is

1) $(14)^4$ 2) $(14)^3$ 3) $(14)^2$ 4) $(14)^1$

63. If A is a non-singular matrix, then

1) A^{-1} is symmetric is A if symmetric

2) A^{-1} is skew-symmetric if A is symmetric

3) $\left|A^{-1}\right| = |A|$

4) $\left|A^{-1}\right| = |A|^2$

64. Matrix $A = \begin{bmatrix} x & 3 & 2 \\ 1 & y & 4 \\ 2 & 2 & z \end{bmatrix}$, if $xyz = 60$ and $8x + 4y + 3z = 20$, then A (adj A) is equal to

1) $\begin{bmatrix} 64 & 0 & 0 \\ 0 & 64 & 0 \\ 0 & 0 & 64 \end{bmatrix}$ 2) $\begin{bmatrix} 88 & 0 & 0 \\ 0 & 88 & 0 \\ 0 & 0 & 88 \end{bmatrix}$ 3) $\begin{bmatrix} 68 & 0 & 0 \\ 0 & 68 & 0 \\ 0 & 0 & 68 \end{bmatrix}$ 4) $\begin{bmatrix} 34 & 0 & 0 \\ 0 & 34 & 0 \\ 0 & 0 & 34 \end{bmatrix}$

65. If A and B are two square matrices such that $B = -A^{-1}BA;$ then $(A+B)^2$ is equal to

1) 0 2) $A^2 + B^2$ 3) $A^2 + 2AB + B^2$ 4) $A + B$

66. If α, β, γ are the roots of the equation $x^3 + px + q = 0$, then the value of the determinant

$$\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix} \text{ is}$$

1) 4 2) 2 3) 0 4) -2

67. If $\alpha, \beta, \gamma \in R$ and $i = \sqrt{-1}$ then the determinant $\Delta = \begin{vmatrix} \left(e^{i\alpha} + e^{-i\alpha}\right)^2 & \left(e^{i\alpha} - e^{-i\alpha}\right)^2 & 4 \\ \left(e^{i\beta} + e^{-i\beta}\right)^2 & \left(e^{i\beta} - e^{-i\beta}\right)^2 & 4 \\ \left(e^{i\gamma} + e^{-i\gamma}\right)^2 & \left(e^{i\gamma} - e^{-i\gamma}\right)^2 & 4 \end{vmatrix}$ is

1) independent of $\alpha, \beta \, and \, \gamma$ 2) dependent on $\alpha, \beta \, and \, \gamma$

3) independent of α, β only 4) independent of α, γ only

68. If $u_n = \begin{vmatrix} n & 1 & 5 \\ n^2 & 2N+1 & 2N+1 \\ n^3 & 3N^2 & 3N \end{vmatrix}$, then $\sum_{n=1}^{N} u_n =$

1) $\frac{N(N+1)}{2}$ 2) N^2 3) N^3 4) 0

69. If $\Delta = \begin{vmatrix} 1+\alpha & 1+\alpha x & 1+\alpha x^2 \\ 1+\beta & 1+\beta x & 1+\beta x^2 \\ 1+\gamma & 1+\gamma x & 1+\gamma x^2 \end{vmatrix}$, then $\Delta =$ __________ where $\alpha \neq \beta \neq \gamma$ are real numbers

1) 0 2) $(\alpha-\beta)(\beta-\gamma)(\gamma-\alpha)$ 3) $\alpha\beta\gamma$ 4) None of these

70. Consider the matrix $A = \begin{pmatrix} 1 & 8 & 0 \\ 2 & -4 & 2 \\ 8 & 3 & 5 \end{pmatrix}$. Let λ be a root of $|A-\lambda I| = 0$. Where I is unit matrix of third order

I. Sum of all values of λ is 11

II. Product of all values of λ is 22

III. Number of column matrices X such that $AX = \lambda_1 X$ is exactly 27 where λ_1 is one value of λ.

Then the number of statements which are true from the above three statements is_______

1) 1 2) 2 3) 3 4) 0

71. $s_n = \alpha^n + \beta^n$ where α and β are real and distinct roots of the equation $ax^2 + bx + c = 0$ and $a,b,c,n \in N$

If $\Delta = \begin{vmatrix} 3 & 1+s_1 & 1+s_2 \\ 1+s_1 & 1+s_2 & 1+s_3 \\ 1+s_2 & 1+s_3 & 1+s_4 \end{vmatrix}; s = \begin{vmatrix} b & 2a \\ 2c & b \end{vmatrix}$

then consider the following statements :

i) $\frac{a^4\Delta}{s}$ is divisible by $(a+b+c)^2$ ii) $\frac{a^4\Delta}{s}$ is divisible by $(a-b+c)$

iii) $\frac{a^4\Delta}{s}$ is a perfect square iv) $\frac{a^4\Delta}{s}$ is divisible by $a^2b^2c^2$

From the above four statements number of statements that is/are false?

1) 3 2) 4 3) 1 4) 2

72. If $abc = p$ and $A = \begin{pmatrix} a & b & c \\ b & c & a \\ c & a & b \end{pmatrix}; a,b,c \neq 0 \in R$ consider the statements

$S_1 : AA^1 = I$

$S_2 : a,b,c$ are roots of equation $x^3 \pm x^2 + p = 0$

now

1) $S_1 \Rightarrow S_2$ is true only when $a+b+c = 3p$

2) $S_2 \Rightarrow S_1$ is true only when $a+b+c = p$

3) $S_1 \Rightarrow S_2$ is true under given hypothesis

4) $S_1 \Rightarrow S_2$ and $S_2 \Rightarrow S_1$ only when $a+b+c = p$

73. If $\Delta = \begin{vmatrix} x^2-5x+3 & 2x-5 & 3 \\ 3x^2+x+4 & 6x+1 & 9 \\ 7x^2-6x+9 & 14x-6 & 21 \end{vmatrix} = ax^3+bx^2+cx+d$, then $\frac{d}{dx}(\Delta) =$

1) 6 2) 5 3) 4 4) 0

74. If x,y,z are the integers and lying between 1 and 9 and $x51, y41$ and z31 are three digit numbers and the value of $\begin{vmatrix} 5 & 4 & 3 \\ x51 & y41 & z31 \\ x & y & z \end{vmatrix}$ is 0, then x,y,z are

1) in G.P 2) equal 3) in A.P 4) None of these

75. A square matrix P satisfies $P^2 = I - P$, where I is an identity matrix, if $P^n = 5I - 8P$, then $n =$

1) 4 2) 5 3) 6 4) 7

76. If A is 6×6 matrix and $\left\| A \right| Adj\left(\left| A \right| A \right)\big| = \left| A \right|^n$, then $n =$

1) 40 2) 31 3) 25 4) 41

77. If $\det(A)=7$ and $A=\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & k \end{bmatrix}$, then $\det(2A)^{-1}$ is equal to

1) $\frac{1}{14}$ 2) $\frac{1}{49}$ 3) $\frac{1}{56}$ 4) $\frac{7}{2}$

78. $\Delta(x)=\begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & x(x+1) \\ 3x(x-1) & x(x-1)(x-2) & x(x^2-1) \end{vmatrix}$, then $\Delta(100)$ equals

1) 0 2) -100 3) 100! 4) -100!

79. Let $P=\left[a_{ij}\right] be\ a\ 3\times 3$ matrix and

$Q=\left[b_{ij}\right] be\ a\ 3\times 3\ matrix\ where\ b_{ij}=2^{i+j}a_{ij}\ for\ 1\le i,j\le 3$.

If the determinant of P is 2, then the determinant of the matrix Q is

1) 2^{10} 2) 2^{11} 3) 2^{12} 4) 2^{13}

80. The parameter on which the value of the determinant

$\begin{vmatrix} 1 & a & a^2 \\ \cos(p-d)x & \cos px & \cos(p+d)x \\ \sin(p-d)x & \sin px & \sin(p+d)x \end{vmatrix}$ does not depend is

1) a 2) p 3) d 4) x

81. The value of θ lying between $\theta = 0$ and $\theta = \pi/2$ and satisfying the equation

$$\Delta = \begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & 1+\cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & \cos^2\theta & 1+4\sin 4\theta \end{vmatrix} = 0$$, are given by

1) $\pi/24, 5\pi/24$ 2) $7\pi/24, 11\pi/24$ 3) $5\pi/24, 7\pi/24$ 4) $11\pi/24, \pi/24$

82. Let $A = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{pmatrix}$ and X_1, X_2 and X_3 be three column matrices such that

$AX_1 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}, AX_2 = \begin{pmatrix} 2 \\ 3 \\ 0 \end{pmatrix}, AX_3 = \begin{pmatrix} 2 \\ 3 \\ 1 \end{pmatrix}$ and let X be a 3x3 matrix such that its columns are X_1, X_2, X_3 is that order. Then sum of elements of X^{-1} is

1) 1 2) 6 3) 0 4) 9

83. If $a_0 + a_1\lambda + a_2\lambda^2 + a_3\lambda^3 + a_4\lambda^4 = \begin{vmatrix} \lambda^2+3\lambda & \lambda-1 & \lambda+3 \\ \lambda^2+1 & 2+5\lambda & \lambda-3 \\ \lambda^2-3 & \lambda+4 & 3\lambda \end{vmatrix}$ then $a_4 =$

1) 5 2) 8 3) 3 4) 2

84. For distinct numbers a,b,c,x,y,z $\in R$ if $\Delta_1 = \begin{vmatrix} (a-x)^2 & (b-x)^2 & (c-x)^2 \\ (a-y)^2 & (b-y)^2 & (c-y)^2 \\ (a-z)^2 & (b-z)^2 & (c-z)^2 \end{vmatrix}$

$\Delta_2 = \begin{vmatrix} (ax+1)^2 & (bx+1)^2 & (cx+1)^2 \\ (ay+1)^2 & (by+1)^2 & (cy+1)^2 \\ (az+1)^2 & (bz+1)^2 & (cz+1)^2 \end{vmatrix}$ then $\frac{\Delta_1^2}{\Delta_2^2} + \frac{\Delta_2^2}{\Delta_1^2} =$

1) $\frac{5}{4}$ 2) $\frac{10}{3}$ 3) $\frac{1}{4}$ 4) None of these

85. If $a \neq p, b \neq q, c \neq r$ and the system of equations $px+by+cz=0, ax+qy+cz=0, ax+by+rz=0$ has a non –zero solution, then value of $\frac{p}{p-a} + \frac{q}{q-b} + \frac{r}{r-c}$ is

1)-1 2) -2 3) 1 4) 2

86. If $l_i^2 + m_i^2 + n_i^2 = 1$ $for\ i = 1,2,3$ & $l_i l_j + m_i m_j + n_i n_j = 0$ for $i, j \in \{1,2,3\}$ and $i \neq j$ and $\Delta = \begin{vmatrix} l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \\ l_3 & m_3 & n_3 \end{vmatrix}$, then

1) $|\Delta| = 3$ 2) $|\Delta| = 2$ 3) $|\Delta| = 1$ 4) $\Delta = 0$

87. If the equations $k\left(6x^2+3\right)+rx+2x^2-1=0$ and $6k\left(2x^2+1\right)+px+4x^2-2=0$ have both roots common, then 2r-p =_________ in all valid cases.

1) 2 2) 1 3) 0 4) k

88. Let $A=\begin{bmatrix} 0 & -\tan(\alpha/2) \\ \tan(\alpha/2) & 0 \end{bmatrix}, \alpha \neq (2n+1)\pi, n \in I, (I+A)(I-A)^{-1}$ equals

1) $\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ 2) $\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ 3) $\begin{bmatrix} \tan\alpha & 0 \\ 0 & \tan\alpha \end{bmatrix}$ 4) $\begin{bmatrix} \tan\alpha & 0 \\ 0 & -\tan\alpha \end{bmatrix}$

89. In a triangle PQR if $\angle R = \frac{\pi}{2}$ and $\tan\frac{P}{2}$, $\tan\frac{Q}{2}$ are the roots of $ax^2+bx+c=0$ then

1) a = b + c 2) b = c + a 3) c = a + b 4) b = c

90. Let $A=\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ *and* $B=\begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix}$ *where* $a, b \in N$. Then

1) there exist infinitely many B's such that AB=BA

2) there cannot exist B such that AB=BA

3) there exist more than one but finite number of B's such that AB=BA

4) there exists exactly one B such that AB = BA