TEST PAPER 9

Total Questions: 60 **Time allotted 75 minutes**

Q.1) If $S = \{x : x^2 + 1 = 0, x \text{ real}\}$ then S is
(a) 0 (b) [0]
(c) [ϕ] (d) ϕ

Q.2) If $A = \{x \in 1\ N : 3 < x < 12\}$ and $B = \{x \in | N : x \text{ is even}, x < 15\}$, then
(a) $A \cup B = \{4,6,8,10,12,14\}$ (b) $A \cap B = \{4,6,8,10\}$
(c) $A / B = \{5,7,9,11,13\}$ (d) $B / A = \{2,8,12,14\}$

Q.3) Consider the following equations for any two sets A and B:
1. $(A-B) \cup B = A$ 2. $(A-B) \cup A = A$
3. $(A-B) \cap B = \phi$ 4. $(A \subseteq B) \Rightarrow B \cup B = B$

Which of these are correct?
(a) 1, 2 and 3 (b) 2, 3 and 4
(c)1, 3 and 4 (d) 1, 2 and 4

Q.4) The value of $x + y$ in the solution of the equations $\frac{x}{4} + \frac{y}{3} = \frac{5}{12}$ and $\frac{x}{2} + y = 1$, is

(a) $\frac{3}{2}$ (b) $\frac{1}{2}$

(c)2 (d) $\frac{5}{2}$

Q.5) Let A and B be subsets of X and let $C = (A \cup B') \cup (A' \cap B)$, then C is equal to
(a) $(A \cup B) / (A \cap B')$ (b) $(A' \cup B) / (A' \cap B)$
(c) $(A \cup B) / (A \cap B)$ (d) $(A' \cup B') / (A' \cap B')$

Q.6) If $A = \{1, 2, 3, 4\}$ and $B = \{2, 3, 5\}$, then identify the correct relation among the following from A to B given by xRy if and only if $x < y$
(a) $R = \{(1, 2), (1, 3), (2, 2), (2, 3)\}$ (b) $R = \{(1, 2), (1, 3), (2, 3), (2, 5)\}$
(c) $R = \{(3, 2), (3, 3), (3, 4), (3, 5)\}$ (d) $R = \{(1, 3), (1, 5), (3, 2), (4, 2)\}$

Q.7) If R be a relation on $N \times N$ defined by (a, b) R(c, d) if and only if $ad = bc$; then R is
(a) an equivalence relation
(b) symmetric and transitive but not reflective
(c) reflexive and transitive but not symmetric
(d) reflexive and symmetric but not transitive

Q.8) Let the points O, P, Q and R on the line correspond to the real numbers zero, p, q and r, where p is negative; q is reciprocal of a natural number and r is greater than $\sqrt{2}$. Then the relative position of O, P, Q and R on the number line are
(a) P-O-R-Q (b) O-P-Q-R
(c) P-O-Q-R (d) P-Q-O-R

Q.9) If the points P and Q represent real numbers $0.\overline{83}$ and $0.\overline{62}$ on the number line, then the distance between P and Q is

(a) $\frac{21}{90}$ (b) $\frac{19}{90}$

(c) $\frac{21}{100}$ (d) $\frac{56}{90}$

Q.10) The principle argument of -1-I is

(a) $\frac{\pi}{4}$ (b) $-\frac{\pi}{4}$

(c) $-\frac{3\pi}{4}$ (d) $\frac{5\pi}{4}$

Q.11) The value of $i^{1000} + i^{1001} + i^{1002} + i^{1003}$ is equal to

(a) 0 (b) i

(c) $-i$ (d) 1

Q.12) In the binary addition, where x, y, z are binary digits the possible values of x, y and z respectively, are

$$\begin{array}{cccccc} & 1 & x & 1 & 0 & 1 \\ + & & 1 & 0 & y & 1 \\ \hline 1 & 0 & 0 & z & 0 & 0 \end{array}$$

(a) 0, 1 and 0 (b) 1, 1 and 0

(c) 0, 0 and 1 (d) 1, 0 and 1

Q.13) The binary numbers $(110\ 111\ 111\ 011)_2$, when written in base 10 equals

(a) 1985 (b) 3357

(c) 2797 (d) 3519

Q.14) The sum of the first n terms of the series $\frac{1}{2}+\frac{3}{4}+\frac{7}{8}+\frac{15}{16}+...$ is

(a) $2^n - n - 1$ (b) $1 - 2^n$

(c) $n + 2^{-n} - 1$ (d) $2^n - 1$

Q.15) Let T_r be the rth term of an AS.P., for $r = 1, 2 \ldots$ If for some distinct positive integers m, n; $T_m = \frac{1}{4}$ and $T_n = \frac{1}{m}$, then T_{mn} is equal to

(a) $\frac{1}{mn}$ (b) $\frac{1}{m}+\frac{1}{n}$

(c) 1 (d) 0

Q.16) The positive value of m for which the roots of the equation $12x^2 + mx + 5 = 0$ are in the ratio 3 : 2, is

(a) $5\sqrt{10}$ (b) $\frac{5\sqrt{10}}{12}$

(c) $\frac{5}{12}$ (d) $\frac{12}{5}$

Q.17) If $x^2 - px + 1$ for all real values of x, then $|p|$

(a) is less than 2 (b) is greater than 1

(c) is greater than 2 (d) can have any value

Q.18) $x + 2$ is a common factor of expression $(x^2 + ax + b)$ and $(x^2 + bx + a)$. The ratio $\frac{a}{b}$ is equal to

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

Q.19) The number of triangles that can be formed by choosing the vertices from a set of 12 points, seven of which lie on the same straight line, is

(a) 185 (b) 175
(c) 115 (d) 105

Q.20) If $S = \{2, 3, 4, 5, 7, 9\}$ then the number of different three-digit numbers (with ail distinct digits) less than 400 that can be formed from S, is

(a) 20 (b) 40
(c) 80 (d) 120

Q.21) The value of ${}^nC_0 - {}^nC_1 + {}^nC_2 - {}^nC_3 ... + (-1)^n \, {}^nC_n$ is equal to

(a) 0 (b) $2^n + 1$
(c) 2^n (d) $2^n - 1$

Q.22) If x is so small that its square and higher powers may be neglected, then $\left(\frac{1-x}{1+x}\right)^{1/2}$ is approximately equal to

(a) $1 - x$ (b) $1 + x$
(c) $2 - x$ (d) $1 - \frac{1}{2}x$

Q.23) If the logarithm of a number to the base $\sqrt{8}$ is 6, then the number is

(a) $\sqrt{48}$ (b) $\frac{\sqrt{8}}{6}$
(c) $6\sqrt{8}$ (d) 512

Q.24) The value of $\log_{10} 40000 - \log_{10} 4$ is equal to

(a) 4 (b) 10000
(c) $\log_{10} 39996$ (d) 39996

Q.25) If A is a 2×3 matrix and AB is a 2×5 matrix, then B must be a

(a) 3×5 matrix (b) 5×3 matrix
(c) 3×2 matrix (d) 5×2 matrix

Q.26) If $A = \begin{pmatrix} 0 & 2 & 3 \\ 2 & 1 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 7 & 6 & 3 \\ 1 & 4 & 5 \end{pmatrix}$ then $3A - 2B$ is the matrix

(a) $\begin{pmatrix} -14 & 6 & -3 \\ 4 & 5 & -2 \end{pmatrix}$ (b) $\begin{pmatrix} 14 & -6 & -3 \\ -4 & -5 & -2 \end{pmatrix}$
(c) $\begin{pmatrix} -14 & -6 & 3 \\ 4 & -5 & 2 \end{pmatrix}$ (d) $\begin{pmatrix} 14 & 6 & -3 \\ 4 & 5 & -2 \end{pmatrix}$

Q.27) If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}, i = \sqrt{-1}$ then A^n is equal to

(a) A for $n = 4$ (b) $-A$ for $n = 6$

(c) $-I$ for $n = 5$ (d) I for $n = 8$

Q.28) If $A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$ and $A^2 - kA - I_2 = 0$ then the value of k is

(a) 4 (b) -4
(c) 8 (d) -8

Q.29) Consider the following statements:

1. If any two rows or columns of a determinant are identical, then the value of the determinant is zero.
2. If the corresponding rows and columns of a determinant are interchanged, then the value of determinant does not change.
3. If any two rows (or columns) of a determinant are interchanged, then the value of the determinant changes in sign.

What of these statements are correct?

(a) 1 and 2 (b) 1 and 3
(c) 2 and 3 (d) 1,2 and 3

Q.30) The value of the determinant $\begin{vmatrix} 1 & 1 & 1 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{vmatrix}$ is equal to

(a) 1440 (b) 1
(c) -1 (d) 0

Q.31) If $\begin{vmatrix} 1+x^3 & x^2 & x \\ 1+y^3 & y^2 & y \\ 1+z^3 & x^2z & \end{vmatrix} = 0$ x, y, z are all different, then the value of xyz is

(a) $(x-y)(y-z)(z-x)$ (b) 0
(c) 1 (d) -1

Q.32) The value of the determinant $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$ is

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

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

Q.33) The value of the determinant of the inverse of the matrix $\begin{pmatrix} -4 & -5 \\ 2 & 2 \end{pmatrix}$ is

(a) $\frac{1}{2}$ (b) 2
(c) 3 (d) 4

Q.34) The matrix $\begin{pmatrix} 2 & 4 \\ -8 & x \end{pmatrix}$ does have an inverse of if x is equal

(a) 16 (b) -16
(c) 8 (d) -8

Q.35) The system of equations $2x + 3y = 5$ and $10x + 15y = 50$

(a) has a unique solution (b) has infinitely many solutions

(c) is inconsistent (d) is consistent and has exactly two solutions

Q.36) If in obtaining the solution of the system of equations $x + y + z = 7$; $x + 2y + 3z = 16$ and $x + 3y + 4z - 22$ by Cramer's rule, the value of y is given be $\frac{\Delta'}{\Delta}$, where $\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 4 \end{vmatrix}$, then the determinant Δ' is given by

(a) $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 4 \end{vmatrix}$ (b) $\begin{vmatrix} 1 & 1 & -7 \\ 1 & 2 & -16 \\ 1 & 3 & -22 \end{vmatrix}$

(c) $\begin{vmatrix} 1 & 1 & -7 \\ 2 & 3 & -16 \\ 3 & 4 & -22 \end{vmatrix}$ (d) $\begin{vmatrix} 1 & 1 & -7 \\ 1 & 3 & -16 \\ 1 & 4 & -22 \end{vmatrix}$

Q.37) The value of $_e\left(\log_0 \tan 1^0 + \log_{10} \tan 2^0 + ... + \log_{10} \tan 89^0\right)$ is equal to

(a) 0 (b) 1

(c) e (d) $\frac{1}{e}$

Q.38) If $1 + \sin x + \sin^2 x + \sin^3 x + \ldots + \infty = 4 + 2\sqrt{3}$ for $0 < x < \pi$; then the value of x is equal to

(a) $\frac{\pi}{6} or \frac{2\pi}{3}$ (b) $\frac{\pi}{4} or \frac{2\pi}{5}$

(c) $\frac{\pi}{3} or \frac{\pi}{6}$ (d) $\frac{\pi}{3} or \frac{2\pi}{3}$

Q.39) If $\tan\theta + \sin\theta = m$ and $\tan\theta - \sin\theta = n$, then

(a) $m^2 - n^2 = 16mn$ (b) $m^2 + n^2 = 16mn$

(c) $(m^2 - n^2)^2 = 16mn$ (d) $(m^2 + n^2)^2 = 16mn$

Q.40) If $\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2}}}} ...\infty = \operatorname{cosec}\theta$, then the value of $\sin\theta$ is equal to

(a) 1 (b) $\frac{1}{4}$

(c) $\frac{1}{\sqrt{2}}$ (d) $\frac{1}{2}$

Q.41) The $\alpha + \beta + \gamma = 2\pi$, then the value of $\tan\frac{\alpha}{2} + \tan\frac{\beta}{2} + \tan\frac{\gamma}{2}$ is equal to

(a) $\tan\frac{\alpha}{2}, \tan\frac{\beta}{2}, + \tan\frac{\gamma}{2}$ (b) $\tan\frac{\alpha}{2}.\tan\frac{\beta}{2} + \tan\frac{\beta}{2}.\tan\frac{\gamma}{2} + \tan\frac{\gamma}{2}.\tan\frac{\alpha}{2}$

(c) $1 - \tan\frac{\alpha}{2}, \tan\frac{\beta}{2}, \tan\frac{\gamma}{2}$ (d) $1 + \tan\frac{\alpha}{2}, \tan\frac{\beta}{2}, \tan\frac{\gamma}{2}$

Q.42) If $\sin\theta = \sin\alpha$, then

(a) $\frac{\theta+\alpha}{2}$ is any odd multiple of $\frac{\pi}{2}$ and $\frac{\theta-\alpha}{2}$ is any multiple of π.

(b) $\frac{\theta+\alpha}{2}$ is any even multiple of $\frac{\pi}{2}$ and $\frac{\theta-\alpha}{2}$ is any multiple of π.

(c) $\frac{\theta+\alpha}{2}$ is any odd multiple of $\frac{\pi}{2}$ and $\frac{\theta-\alpha}{2}$ is any multiple of π.

(d) $\frac{\theta+\alpha}{2}$ is any odd multiple of $\frac{\pi}{2}$ and $\frac{\theta-\alpha}{2}$ is any even of π.

Q.43) If for $A, B \in [0, \pi/2]$; $\sin(A + B) = 1$ and $\sin(A - B) = 1/2$ then the value of $\tan(A + 2/B)$ is equal to

(a) -1 (b) 0

(c) 1 (d) 2

Q.44) Two ships leave a port at the same instant. One sails at 30 km per hour in the direction N 32^0E while the other sails at 20 km per hour in the direction S 58^0E. After 2 hours, the ships are distant from each other by

(a) 100 km (b) 36.5 km

(c) $20\sqrt{13}$ km (d) $15\sqrt{6}$ km

Q.45) The value of $\sin^{-1}\left(\frac{3}{5}\right)+\tan^{-1}\left(\frac{1}{7}\right)$ is equal to

(a) π (b) $\frac{\pi}{2}$

(c) $\frac{\pi}{4}$ (d) $\frac{\pi}{8}$

Q.46) The value of $\tan\left[\frac{1}{2}\cos^{-1}\left(\frac{\sqrt{5}}{3}\right)\right]$ is equal to

(a) $\frac{2}{5-\sqrt{5}}$ (b) $\frac{2}{5+\sqrt{5}}$

(c) $\frac{3+\sqrt{5}}{2}$ (d) $\frac{3-\sqrt{5}}{2}$

Q.47) An observer measures angles of elevation of two towers of equal heights from a point between the towers. If the angles of elevation are 60^0 and 30^0 and distance of the nearer tower is 100 metres, then the height of each tower and the distance between the towers respectively are

(a) $\frac{100}{\sqrt{3}}$ m and 400 m (b) $\frac{100}{\sqrt{3}}$ m and 300 m

(c) $100\sqrt{3}$ m and 400 m (d) $100\sqrt{3}$ m and 200 m

Q.48) If from the top of a light-house, 100 metres high, the angle of depression of a boat is $\tan^{-1}\left(\frac{5}{12}\right)$, then the distance in metres, between the boat and the light-house, is equal to

(a) $\frac{125}{3}$ (b) 120

(c) 240 (d) 260

Q.49) If the vertices *B* and *D* of a square ABCD be (2, 3) and (4, 1) respectively, then the length of its side is

(a) 1 unit (b) 2 units
(c) 3 units (d) 4 units

Q.50) The *x*-intercept and the *y*-intercept of the line $5x - 7 = 6y$, respectively are

(a) $\frac{7}{5}$ and $\frac{7}{6}$ (b) $\frac{7}{5}$ and $\frac{-7}{6}$
(c) $\frac{5}{7}$ and $\frac{6}{7}$ (d) $\frac{-5}{7}$ and $\frac{6}{7}$

Q.51) The perpendicular form of the straight line $\sqrt{3}x + 2y = 7$ is

(a) $y = \frac{\sqrt{3}}{2}x + \frac{7}{2}$ (b) $\frac{x}{7/\sqrt{3}} + \frac{y}{7/2} = 1$
(c) $\frac{\sqrt{3}}{\sqrt{7}}x + \frac{2}{\sqrt{7}}y = \sqrt{7}$ (d) $\frac{\sqrt{3}}{\sqrt{7}}x + \frac{2}{\sqrt{7}}y = 7$

Q.52) If the points with coordinates $(-a, 0); (ap^2, 2ap)$ and $(ap_1^2, 2ap_1)$ are collinear, then the value of pp_1 is

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

Q.53) If β is the acute angle between the lines $px + qy = p + q$; and $P(x - y) + q(x + y) = 2q$, then the value of sin β is

(a) $\frac{\sqrt{3}}{2}$ (b) $\frac{3}{4}$
(c) $\frac{1}{2}$ (d) $\frac{1}{\sqrt{2}}$

Q.54) The Cartesian equation of the curve
$x = 5 + 3\cos\alpha$
$y = 7 + 3\sin\alpha$
is represented by

(a) $(x-3)^2 + (y-5)^2 = 6$ (b) $(x-5)^2 + (y-7)^2 = 9$
(c) $y = 3x + 7$ (d) $(y-2) + (x-7) = 5$

Q.55) If r_1, r_2 and r_3 are the radii of the circles $x^2 + y^2 - 4x + 6y = 5, x^2 + y^2 + 6x - 4y = 3$ and $x^2 + y^2 2x + 4y = 8$ respectively, then

(a) $r_1 > r_2 > r_3$ (b) $r_2 > r_3 > r_1$
(c) $r_3 > r_1 > r_2$ (d) $r_1 > r_3 > r_2$

Q.56) If a_1, b_1, c_1, f_1, g_1 and h_1 are real numbers such that $g_1^2 + f_1^2 < c_1 a_1$, then the equation $a_1x^2 + 2h_1xy + b_1y^2 + 2g_1x + 2f_1y + c_1 = 0$ represents a circle if and only if

(a) $a_1 = b_1$ (b) $a_1 = b_1, h_1 = 0$
(c) $a_1 = b_1, a_1 \neq 0, h_1 = 0$ (d) $a_1 = b_1, a_1 \neq 0, h_1 \neq 0$

Q.57) The equation of the parabola whose focus is (-3, 0) and the directrix $x + 5 = 0$, is

(a) $y^2 = (x + 4)$ (b) $y^2 = 4(x + 4)$
(c) $y^2 = 4(x – 4)$ (d) $y^2 = -4(x – 4)$

Q.58) The equation of the ellipse with foci at ($\pm$5, 0) and $x = \frac{36}{5}$ as one directrix is

(a) $\frac{x^2}{3} + \frac{y^2}{5} = 1$ (b) $\frac{x^2}{36} + \frac{y^2}{11} = 1$

(c) $\frac{x^2}{36} + \frac{y^2}{9} = 1$ (d) $\frac{x^2}{11} + \frac{y^2}{36} = 1$

Q.59) The equation $2x^2 – 3y^2 – 6 = 0$ represents a
(a) circle (b) parabola
(c) ellipse (d) hyperbola

Q.60) The equation of the axis of the parabola $x^2 – 4y + 8 = 0$ is
(a) $y = 0$ (b) $y = 2$
(c) $x = 0$ (d) $x = 2$

ANSWER KEYS

1.	(d)	13.	(d)	25.	(a)	37.	(b)	49.	(b)
2.	(b)	14.	(c)	26.	(c)	38.	(d)	50.	(b)
3.	(b)	15.	(c)	27.	(d)	39.	(c)	51.	(c)
4.	(a)	16.	(a)	28.	(a)	40.	(d)	52.	(c)
5.	(b)	17.	(c)	29.	(d)	41.	(a)	53.	(d)
6.	(c)	18.	(a)	30.	(d)	42.	(a)	54.	(b)
7.	(c)	19.	(a)	31.	(d)	43.	(c)	55.	(a)
8.	(c)	20.	(b)	32.	(d)	44.	(c)	56.	(b)
9.	(b)	21.	(a)	33.	(a)	45.	(c)	57.	(b)
10.	(b)	22.	(a)	34.	(b)	46.	(b)	58.	(b)
11.	(a)	23.	(d)	35.	(b)	47.	(c)	59.	(d)
12.	(a)	24.	(a)	36.	(d)	48.	(c)	60.	(c)