LEVEL # 1

Q.1 Let α and β be the roots of $(2x - b)(3x - c) + 2(3x - c)(x - a) + 3(x - a)(2x - b) = 0$. Then both α and β are

(1) positive (2) real (3) negative (4) None of these

Q.2 The roots of the equation $x^4 + 4x^2 + 16 = 0$ are

(1) $\pm\omega, \pm\omega^2$ (2) $\pm\frac{1}{2}\omega, \pm\frac{1}{2}\omega^2$ (3) $\pm 2\omega, \pm 2\omega^2$ (4) $\pm 2\omega, \pm 4\omega^2$

Q.3 If $\alpha, \beta, \gamma, \delta$ are the roots of $16x^4 + 4x^2 + 1 = 0$, then the value of $\alpha^4 + \beta^4 + \gamma^4 + \delta^4$ is

(1) $-\frac{1}{8}$ (2) 0 (3) $\frac{1}{8}$ (4) 1

Q.4 If $\alpha, \beta, \gamma, \delta$ are the roots $x^4 + x^2 + 1 = 0$ then the value of $(\alpha + \beta)(\alpha + \delta)(\beta + \gamma)(\beta + \delta)(\gamma + \delta)$ is

(1) -1 (2) 0 (3) 1 (4) None of these

Q.5 Let $\frac{\alpha}{\alpha - 1}$ and $\frac{\beta}{\beta - 1}$ be the roots of $x^2 + ax + b = 0$, then $\frac{1}{\alpha}$ and $\frac{1}{\beta}$ are the roots of

(1) $bx^2 + ax + 1 = 0$ (2) $bx^2 - ax + 1 = 0$

(3) $bx^2 + (a + 2b)x + a + b + 1 = 0$ (4) $bx^2 - (a + 2b)x + a + b + 1 = 0$

Q.6 Let α and β be the rookts of $x^2 + (2b - a^2)x + b^2 = 0$ and α' and β' be those of $x^2 + (2a - b^2)x + a^2 = 0$. If $\sqrt{\alpha} - \sqrt{\beta} = \sqrt{\alpha'} - \sqrt{\beta'}$ then $(a + b)$ is equal to

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

Q.7 Let α, β be the roots of $ax^2 + bx + c = 0$ and $\alpha + K, \beta + K, \gamma$ be the roots of $px^3 + qx^2 + rx = 0$. If α, β, k are positive, then $\frac{b^2 - 4ac}{q^2 - 4pr}$ is

(1) $\frac{a}{p}$ (2) $\frac{p}{a}$ (3) $\frac{a^2}{p^2}$ (4) $\frac{p^2}{a^2}$

Q.8 If $\alpha + \beta$ and $\alpha\beta$ are the roots of $x^2 - 2x - 8 = 0$ then the equation whose roots are α and β is

(1) $x^2 + 2x + 4 = 0$ (2) $x^2 - 2x + 4 = 0$ (3) $4x^2 + 2x + 4 = 0$ (4) $x^2 - 4x + 4 = 0$

Q.9 Let α and β be the roots of $(x - a)(x - b) + c = 0$, $c \neq 0$, then the roots of $(\alpha\beta - c)x^2 + (\alpha + \beta)x + 1 = 0$ are

(1) $\frac{1}{a}, \frac{1}{b}$ (2) $-\frac{1}{a}, \frac{1}{b}$ (3) $\frac{1}{a}, -\frac{1}{b}$ (4) $-\frac{1}{a}, -\frac{1}{b}$

Q.10 Let α and β be the roots of $x^2 + ax + b = 0$ and $\alpha(\alpha - \beta) + h$ and $\beta(\alpha - \beta) + h$ be those of $x^2 + px + q = 0$, then

(1) $p^2 - 4q = a^2 - 4b$ (2) $p^2 - q = a^2 - b$

(3) $p^2 - q = (a^2 - b)^2$ (4) $p^2 - 4q = (a^2 - 4b)^2$

Q.11 The number of real roots of the equation $1 + a_1x + a_2x^2 + ... + a_nx^n = 0$ where $|x| < \frac{1}{3}$ and $|a_n| < 2$, is

(1) n if n is even (2) 0 for any nuatural number n

(3) 1 if n is odd (4) None of these

Q.12 The roots of the equation $x^5 - 40x^4 + px^3 + qx^2 + rx + S = 0$ are in the geometric progression and the sum of the their reciprocal is 10. Then $|S|$ is equal to

(1) 64 (2) 16 (3) 32 (4) None of these

Q.13 The difference of the roots of the equation $px^2 + qx + r = 0$ is

(1) $\frac{\sqrt{p^2 - 4qr}}{p}$ (2) $\frac{\sqrt{p^2 - 2qr}}{p}$ (3) $\frac{\sqrt{q^2 - 4qr}}{p}$ (4) $\frac{\sqrt{q^2 - 4r}}{p}$

Q.14 The quadratic equation with real coefficients whose one root is $7 + 5i$ will be

(1) $x^2 - 14x - 74 = 0$ (2) $x^2 + 14x + 74 = 0$

(3) $x^2 + 14x - 74 = 0$ (4) $x^2 - 14x + 74 = 0$

Q.15 If the roots of the equation $12x^2 + mx + 5 = 0$ are in the ratio 3 : 2 then m is equal to

(1) $\frac{12}{5}$ (2) $\frac{5}{12}$ (3) $\frac{5\sqrt{10}}{12}$ (4) $5\sqrt{10}$

Q.16 The roots of the equation $ax^2 + bx + c = 0$ will be imaginary if

(1) $a > 0, b = 0, c < 0$ (2) $a > 0, b = 0, c > 0$

(3) $a = 0, b > 0, c > 0$ (4) $a > 0, b > 0, c = 0$

Q.17 If $x + k$ is a common factor of the expression $x^2 + px + q$ and $x^2 + \ell x + m$, then k is equal to

(1) $\frac{p + q}{\ell + m}$ (2) $\frac{p - \ell}{q - m}$ (3) $\frac{q + m}{p + \ell}$ (4) $\frac{q - m}{p - \ell}$

Q.18 If sum of the roots of the equation $ax^2 + bx + c = 0$ is equal to the sum of their squares, then
(1) $2ac = ab + c$ (2) $2ac = b(a + b)$ (3) $a^2 + b^2 = c^2$ (4) $a^2 + b^2 = a + b$

Q.19 If $y = mx + c$ and $x^2 + y^2 = a^2$, then two values of x will be equal if c is equal to
(1) $\frac{a}{m}$ (2) $a\sqrt{1+m^2}$ (3) am (4) $a\sqrt{1-m^2}$

Q.20 The HM of the roots of the equation $x^2 - 8x + 4 = 0$ is
(1) 1 (2) 2 (3) 3 (4) None of these

Q.21 If 1, a_1, a_2, ... a_{n-1} are n^{th} roots of unity, then $(1 - a_1)(1 - a_2)$ ..... $(1 - a_{n-1})$ is equal to
(1) n (2) –n (3) 1 (4) –1

Q.22 If x be real then the value of $\frac{x^2+34x-71}{x^2+2x-7}$ will not lie between
(1) –5 and 9 (2) 5 and 9 (3) –9 and –5 (4) 0 and 9

Q.23 If c, d are roots of the equation $(x - a)(x - b) - k = 0$ then the roots of the equation $(x - c)(x - d) + k = 0$ will be
(1) –a, –b (2) a, b (3) $\frac{1}{a}, \frac{1}{b}$ (4) None of these

Q.24 If the roots of both the equations $px^2 + 2qx + r = 0$ and $qx^2 - 2\sqrt{pr}\,x + q = 0$ are real, then
(1) $p = q, r \neq 0$ (2) $2q = \pm\sqrt{pq}$ (3) $\frac{p}{q} = \frac{q}{r}$ (4) None of these

Q.25 If x be real then the value of the expression $\frac{(x+m)^2-4mn}{2(x-n)}$ will not
(1) lie between m and m + n (2) lie between 2m and 2n
(3) greater than m + 2n (4) greater than m + n

Q.26 If $x = 2 + 2^{1/3} + 2^{2/3}$, then $x^3 - 6x^2 + 6x$ equals
(1) 2 (2) –2 (3) 0 (4) 1

Q.27 The equation $|2x - x^2 - 3| = 1$ has real solutions
(1) only one (2) Four (3) infinite (4) none

Q.28 If $x^2 - 2x(1 + 3m) + 7(3 + 2m) = 0$ has equal roots, then the greater of the two values of m is

(1) $\frac{10}{9}$ (2) 2 (3) $-\frac{10}{9}$ (4) –2

Q.29 The imaginary roots of the equation $(x^2 + 2)^2 + 8x^2 = 6x(x^2 + 2)$ are

(1) $1 \pm i$ (2) $2 \pm i$ (3) $-1 \pm i$ (4) None of these

Q.30 If sum of the roots of the equation $ax^2 + bx + c = 0$ is equal to the sum of the squares of their reciprocals, then $\frac{b^2}{ac} + \frac{bc}{a^2}$ equals

(1) 2 (2) –2 (3) 1 (4) –1

Q.31 Equation $(c^2 + a^2)x^2 - 2(a + b)cx + (b^2 + c^2) = 0$ has equal roots if

(1) a, b, c are in A.P. (2) a, b, c are in G.P.

(3) a, c, b are in A.P. (4) a, c, b are in G.P.

Q.32 If $\alpha, \beta, \gamma, \delta$ are in G.P. where α, β are roots of the equation $ax^2 + 2bx + c = 0$ and γ, δ are roots of the equation $px^2 + 2qx + r = 0$, then

(1) $\frac{ac}{b^2} = \frac{pr}{q^2}$ (2) $\frac{ac}{b} = \frac{pr}{q}$ (3) $\frac{ab}{c^2} = \frac{pq}{r^2}$ (4) None of these

Q.33 If the roots of $x^2 + x + a = 0$ exceed a, then

(1) $2 < a < 3$ (2) $a > 3$ (3) $-3 < a < -3$ (4) $a < -2$

Q.34 The roots of the equation $|x^2 - x - 6| = x + 2$ are

(1) 0, 1, 2 (2) 1, 2, 4 (3) –2, 2, 4 (4) –2, 2, 3

Q.35 If roots of the equation $x^2 - bx + c = 0$ are two successive integers then $b^2 - 4c$ is equal to

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

LEVEL # 2

Q.1 If α and β are the root of $ax^2 + bx + c = 0$, then the value of $\left\{\frac{1}{a\alpha+b}+\frac{1}{a\beta+b}\right\}$ is -

(1) $\frac{a}{bc}$ (2) $\frac{b}{ca}$ (3) $\frac{c}{ab}$ (4) None of these

Q.2 The imaginary roots of the equation $(x^2 + 2)^2 + 8x^2 = 6x(x^2 + 2)$ are

(1) $1 \pm i$ (2) $2 \pm i$ (3) $-1 \pm i$ (4) None of these

Q.3 If one root of $5x^2 + 13x + k = 0$ is reciprocal of the other, then -

(1) $k = 0$ (2) $k = 5$ (3) $k = 1/6$ (4) $k = 6$

Q.4 If the sum of the roots of $ax^2 + bx + c = 0$ be equal to sum of the squares, then -

(1) $2ac = ab + b^2$ (2) $2ab = bc + c^2$ (3) $2bc = ac + c^2$ (4) None of these

Q.5 If the roots of $ax^2 + bx + c = 0$ are in the ratio m : n then -

(1) $mna^2 = (m + n)c^2$ (2) $mnb^2 = (m + n)ac$

(3) $mnb^2 = (m + n)^2 ac$ (4) None of these

Q.6 If $2^x = 4^y = 8^z$ and $xyz = 288$ then -

(1) $x = 12, y = 6, z = 2$ (2) $x = 12, y = 4, z = 6$

(3) $x = 12, y = 6, z = 4$ (4) $x = 12, y = 4, z = 2$

Q.7 If the sum of the roots of a quadratic equation is 3 and sum of their cubes is 7, then the equation will be -

(1) $9x^2 - 27x + 20 = 0$ (2) $9x^2 + 27x + 20 = 0$

(3) $9x^2 + 20x - 27 = 0$ (4) $27x^2 - 9x + 20 = 0$

Q.8 If one root of equation $x^2 + px + 12 = 0$ is 4, while the equation $x^2 + px + q = 0$ has equal roots then the value of q is -

(1) $\frac{49}{4}$ (2) $\frac{4}{49}$ (3) 4 (4) None of these

Q.9 The numbers of real root of $3^{2x^2-7x+7} = 9$ is -

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

Q.10 If the sum of the roots of the equation $(a + 1)x^2 + (2a + 3)x + (3a + 4) = 0$ is - 1, then the product of the roots is -

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

Q.11 The condition that the equation $x^3 - px^2 + qx - r = 0$ may have two of its roots equal to each other but of opposite signs is -

(1) $pq - r = 0$ (2) $2p^3 + pq - r = 0$ (3) $p^2q = r$ (4) None of these

Q.12 If a, b be the roots of $x^2 + x + 1 = 0$ and c, d those of $x^2 + 3x + 1 = 0$, then the value of $(a - c)(b - c)(a + d)(b + d)$ is :

(1) 8 (2) 4 (3) 2 (4) 0

Q.13 The solution set of $(\log_3 x) - \log_3 x - 320$ is –

(1) $(\sqrt{27}, \infty)$ (2) $(-\infty, \sqrt{27})$ (3) $(0, \sqrt{27})$ (4) None of these

Q.14 If α, β be the roots of the equation $p(x^2 + n^2) + pnx + qn^2x^2 = 0$ then the value of $p(\alpha^2 + \beta^2) + p\alpha\beta + q\alpha^2\beta^2$ is -

(1) $\alpha + \beta$ (2) 0 (3) $p + q$ (4) $\alpha + \beta + p + q$

Q.15 If $x + 1$ is a factor of the expression $x^4 + (p - 3)x^3 - (3p - 5)x^2 + (2p - 9)x + 6$ then the value of is -

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

Q.16 If the equation $\frac{a}{x-a} + \frac{b}{x-b} = 1$ has roots equal in magnitude but opposite in sign, then the value of $a + b$ is -

(1) –1 (2) 0 (3) 1 (4) None of these

Q.17 It the sum of the roots of the equation $ax^2 + 4x + c = 0$ is half of their difference, then the value of ac is -

(1) 4 (2) 8 (3) 12 (4) – 12

Q.18 If α, β be the roots of $x^2 + mx + m^2 + p = 0$, then the value of $\alpha^2 + \alpha\beta + \beta^2 + p$ will be equal to -

(1) m (2) – m (3) 0 (4) None of these

Q.19 The roots of equation $\log_2 (x^2 - 4x + 5) = (x - 2)$ are –

(1) 4, 5 (2) 2, – 3 (3) 2, 3 (4) 3, 5

Q.20 If the equation $x^2 - ax + b = 0$ and $x^2 + bx - a = 0$ have a common root, then

(1) $a = b$ (2) $a + b = 0$ (3) $a + b = 1$ (4) None of these

Q.21 The quadratic equation with real coefficients one of whose complex roots has the real part 12 and modulus 13 is-

(1) $x^2 - 12x + 13 = 0$ (2) $x^2 - 24x + 13 = 0$

(3) $x^2 - 24x + 169 = 0$ (4) $x^2 - 24x - 169 = 0$

Q.22 The number of real roots of the equation $\left(x+\frac{1}{x}\right)^3 + \left(x+\frac{1}{x}\right) = 0$ is-

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

Q.23 Given that $ax^2 + bx + c = 0$ has no real root and $a + b + c < 0$, then :

(1) $c = 0$ (2) $c > 0$ (3) $c < 0$ (4) $c \neq 0$

Q.24 If $a + b + c = 0$, then the roots of the equation $3ax^2 + 4bx + 5c = 0$ are :

(1) Positive (2) Negative (3) Real and distinct (4) Complex

Q.25 If α and β are the roots of $x^2 + x + 1 = 0$, then $2\alpha^{13} + 3\beta^{13}$ and $3\alpha^{31} + 2\beta^{31}$ are the roots of-

(1) $x^2 - x + 1 = 0$ (2) $x^2 + 5x + 7 = 0$ (3) $x^2 - 5x - 7 = 0$ (4) $x^2 + 5x - 7 = 0$

Q.26 If the roots of the equation $x^2 + 2ax + b = 0$ are real and distinct and they differ by at most 2m, then b lies in the interval :

(1) $(a^2 - m^2, a^2)$ (2) $[a^2 - m^2, a^2)$ (3) $(a^2, a^2 + m^2)$ (4) None of these

Q.27 If the roots of the equation $(x - b)(x - c) + (x - c)(x - a) + (x - a)(x - b) = 0$ are equal, then -

(1) $a + b + c = 0$ (2) $a + b\omega + c\omega^2 = 0$

(3) $a - b + c = 0$ (4) None of these

Q.28 If $a \in Z$ and the equation $(x - a)(x - 10) + 1 = 0$ has integral roots, then the values of a are-

(1) 10, 8 (2) 12, 10 (3) 12, 8 (4) None of these

Q.29 If α, β be the roots of the equation $(x - a)(x - b) + c = 0$ $(c \neq 0)$, then the roots of the equation $(x - c - \alpha)(x - c - \beta) = c$ are-

(1) a and b + c (2) a + c and b (3) a + c and b + c (4) a - c and b - c

Q.30 If the sum of the squares of the roots of the equation $x^2 - (\sin\alpha - 2)x - (1 + \sin\alpha) = 0$ is least, then α =

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{3}$ (3) $\frac{\pi}{2}$ (4) $\frac{\pi}{6}$

Q.31 The set of values of x which satisfy $5x + 2 < 3x + 8$ and $\frac{x+2}{x-1} < 4$ is-

(1) (2, 3) (2) $(-\infty, 1) \cup (2, 3)$ (3) $(-\infty, 1)$ (4) (1, 3)

Q.32 If x, a, b, c are real and $(x - a + b)^2 + (x - b + c)^2 = 0$, then a, b, c are in :

(1) A.P. (2) G.P. (3) H.P. (4) None of these

Q.33 If the equation $(3x)^2 + (27 \times 3^{1/p} - 15)x + 4 = 0$ has equal roots, then p =

(1) $-\frac{1}{2}$ (2) $\frac{1}{2}$ (3) $-\frac{1}{3}$ (4) $\frac{1}{3}$

Q.34 The number of quadratic equations which are unchanged by squaring their roots is-

(1) 2 (2) 4 (3) 6 (4) None of these

Q.35 If every pair from among the equations $x^2 + px + qr = 0$, $x^2 + qx + rp = 0$ and $x^2 + rx + pq = 0$ has a common root, then sum of three common roots is-

(1) 2 (p + q + r) (2) p + q + r (3) – (p + q + r) (4) pqr

Q.36 The integer k for which the inequality $x^2 - 2(4k - 1)x + 15k^2 - 2k - 7 > 0$ is valid for any x is-

(1) 2 (2) 3 (3) 4 (4) None of these

Q.37 If $(ax^2 + c)y + (a'x^2 + c') = 0$ and x is a rational function of y and ac is negative, then-

(1) ac' + a'c = 0 (2) $\frac{a}{a'} = \frac{c}{c'}$ (3) $a^2 + c^2 = a'^2 + c'^2$ (4) aa' + cc' = 1

Q.38 The roots of the equation $\left(a+\sqrt{b}\right)^{x^2-15} + \left(a-\sqrt{b}\right)^{x^2-15} = 2a$, where $a^2 - b = 1$

(1) ± 2, ± $\sqrt{3}$ (2) ± 4, ± $\sqrt{14}$ (3) ± 3, ± $\sqrt{5}$ (4) ± 6, ± $\sqrt{20}$

Q.39 Let α, β, γ be the roots of the equation $x^3 + 3ax^2 + 3bx + c = 0$. If α, β, γ are in H.P., then β is equal to-

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

Q.40 The equations $ax^2 + bx + a = 0$ and $x^3 - 2x^2 + 2x - 1 = 0$ have two roots in common, then a + b must be equal to-

(1) 1 (2) – 1 (3) 0 (4) None of these

Q.41 Root(s) of the equation $9x^2 - 18|x| + 5 = 0$ belonging to the domain of definition of the function $f(x) = \log(x^2 - x - 2)$ is/are-

(1) $-\frac{5}{3}, -\frac{1}{3}$ (2) $\frac{5}{3}, \frac{1}{3}$ (3) $-\frac{5}{3}$ (4) $-\frac{1}{3}$.

LEVEL # 3

Q.1 The integral k for which the inequality $x^2 - 2(4k-1)x + 15k^2 - 2k - 7 < 0$ is valid for any x is-

(1) 2 (2) 3 (3) 4 (4) None of these

Q.2 If $x^{2/3} + x^{1/3} - 2 = 0$ then x =

(1) – 2, 1 (2) –8, –2 (3) –8, 1 (4) None of these

Q.3 The equation $2\cos^{-1} x + \sin^{-1} x = \frac{11\pi}{6}$ has -

(1) No solution (2) Only one solution (3) Two solution (4) infinite solution

Q.4 The solution set of $\frac{x^{\frac{1}{2}\log_2 x}}{4} = 2^{\frac{\log_2^2 x}{4}}$ is, x =

(1) $2^{-2\sqrt{2}}, 2^{2\sqrt{2}}$ (2) 2 (3) $2^{\sqrt{2}}, 2^{-\sqrt{2}}$ (4) None of these

Q.5 The number of positive integral solution of $\frac{x^2(3x-4)^3(x-2)^4}{(x-5)^5(2x-7)^6} \le 0$ are

(1) Three (2) One (3) Two (4) None of these

Q.6 Given that the equation $z^2 + (p + iq)z + r + is = 0$ has a real root. Then -

(1) $pqr = r^2 + p^2s$ (2) $prs = q^2 + r^2p$ (3) $qrs = p^2 + s^2q$ (4) $pqs = s^2 + q^2r$

Q.7 The numbers of real roots of the equation $\left(\frac{3}{5}\right)^x + \frac{7}{5} = 2^x$

(1) Form a null set (2) Is only one (3) Is more than one (4) None of these

Q.8 The system of equation $\left.\begin{array}{l}\log_y x - \log_x y = 0\\ 2\log_2 x + \log_2 y = 3\end{array}\right\}$ has -

(1) No solution (2) Exactly one solution
(3) Two solutions (4) Infinite solution

Q.9 The number of integral values of x satisfying the system of inequalities $\left.\begin{array}{l}x^2 - 4x - 77 < 0\\ x^2 \ge 4\end{array}\right\}$ is-

(1) 6 (2) 10 (3) 14 (4) None of these

Q.10 If x satisfies $|x - 1| + |x - 2| + |x - 3| \geq 6$ then -

(1) $0 \leq x \leq 4$ (2) $x \leq -2$ or $x \geq 4$ (3) $x \leq 0$ or $x \geq 4$ (4) None of these

Q.11 If α, β are roots of $ax^2 + bx + c = 0$ then the equation $ax^2 - bx(x - 1) + c(x - 1)^2 = 0$ has roots-

(1) $\frac{\alpha}{1-\alpha}, \frac{\beta}{1-\beta}$ (2) $\frac{1-\alpha}{\alpha}, \frac{1-\beta}{\beta}$ (3) $\frac{\alpha}{1+\alpha}, \frac{\beta}{1+\beta}$ (4) $\frac{\alpha+1}{\alpha}, \frac{\beta+1}{\beta}$

Q.12 If $\alpha, \beta, \gamma, \sigma$ are the roots of the equation $x^4 + 4x^3 - 6x^2 + 7x - 9 = 0$ then the value of $(1 + \alpha^2)(1 + \beta^2)(1 + \gamma^2)(1 + \sigma^2)$ is -

(1) 5 (2) 9 (3) 11 (4) 13

Q.13 The numbers of solutions of the equation $\sin\left(\frac{\pi x}{2\sqrt{3}}\right) = x^2 - 2\sqrt{3}x + 4$

(1) Forms an empty set (2) is only one

(3) is only 2 (4) is greater than 2

Q.14 If a and b are the roots of the equation $x^2 - 2x + 3 = 0$, find the equation whose roots are $a^3 - 3a^2 + 5a - 2$ and $b^3 - b^2 + b + 5$

(1) $x^2 + 3x + 2 = 0$ (2) $x^2 - 3x - 2 = 0$ (3) $x^2 - 3x + 2 = 0$ (4) $x^2 + 3x - 2 = 0$

Q.15 If $\frac{x}{b+c-a} = \frac{y}{c+a-b} = \frac{z}{a+b-c}$ then the value of $(b - c)x + (c - a)y + (a - b)z =$

(1) abc (2) a + b + c (3) 0 (4) None of these

Q.16 Let z be a complex number. Then the region represented by the inequality $|z + 2| < |z + 4|$ is given by -

(1) Re (z) > – 3 (2) Im (z) < – 3

(3) Re (z) < – 3 and Im (z) > – 3 (4) Re (z) < – 4 and Im (z) > – 4

Q.17 If $2c_0 + c_1 + c_2 = 0$, then the equation $c_0 + c_1x + c_2x^2 = 0$ has -

(1) One root in (0, 1) (2) One root in (–1,0) and the other in (2,4)

(3) Imaginary roots (4) None of these

Q.18 The number of real roots of the equation $3^x = 10 - \log_2 x$ is -

(1) 1 (2) 2 (3) 3 (4) None of these

Q.19 The number of quadratic equations which are unchanged by squaring their roots are -

(1) 2 (2) 3 (3) 4 (4) None of these

Q.20 If the difference of the root of the equation $x^2 + ax + b = 0$ is equal to the difference of the roots of the equation $x^2 + bx + a = 0$, then -

(1) $a + b = 4$ (2) $a + b = -4$ (3) $a - b = 4$ (4) $a - b = -4$

Q.21 If the difference of the roots is equal to the product of the roots of the equation $2x^2 - (a + 1)x + (a - 1) = 0$ then find the value of a -

(1) 2 (2) 3 (3) 4 (4) 5

Q.22 α, β are the roots of the equation $k(x^2-x) + x + 5 = 0$, If k_1 and k_2 are two values of k for which the roots α, β are connected by the relation $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{4}{5}$ then the value of $\left(\frac{k_1}{k_2} + \frac{k_2}{k_1}\right) =$

(1) 127 (2) 254 (3) 508 (4) k_1k_2

Q.23 The number of real solutions of the system of equation $x = \frac{2z^2}{1+z^2}$, $y = \frac{2x^2}{1+x^2}$, $z = \frac{2y^2}{1+y^2}$ is

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

Q.24 If a polynomial $f(x) = a_0x^n + a_1x^{n-1} + a_2x^{n-2} + ...a_{n-1}x + a_n$ with integral coefficients assumes odd values for x = 0 and x = 1, then the equation f(x) = 0 possesses -

(1) No integral roots (2) Integral roots (3) Positive roots (4) Negative roots

Q.25 For any real x the expression $2(m - x)\left[x + \sqrt{x^2 + m^2}\right]$ can not exceed than -

(1) m^2 (2) $2m^2$ (3) $3m^2$ (4) None of these

Q.26 The number of all positive integral roots of the equation $mx = m + 15x$ is -

(1) 3 (2) 4 (3)5 (4) None of these

Q.27 The solution set of the equation $\log(8 - 10x - 2x^2) = 3\log(2x - 1)$ is -

(1) 2 (2) $\pm\sqrt{2}$ (3) 1 (4)None of these

Q.28 The number of real solutions of the system $\left.\begin{matrix} x + y + z = 1 \\ 2xy - z^2 = 1 \end{matrix}\right\}$ is

(1) 1 (2) 2 (3) 4 (4) None of these

Q.29 The number of integral solutions of $\sin\left(\frac{x}{2}\right) > \frac{1}{2}$ and *I*n $x < 2$ are -

(1) Three (2) Four (3) Five (4) Six

Q.30 The values of the parameter a for which the quadratic equation $(1 - 2a)x^2 - 6ax - 1 = 0$ and $ax^2 - x + 1 = 0$ have at least one root in common are -

(1) $a = 0, a = \frac{1}{2}$ (2) $a = \frac{1}{2}, a = \frac{2}{9}$ (3) $a = \frac{2}{9}$ (4) $a = 0, a = \frac{1}{2}, a = \frac{2}{9}$

Q.31 The values of a for which $2x^2 - 2(2a + 1)x + a(a + 1) = 0$ may have one root less than a and other root greater than 'a' is -

(1) $1 > a > 0$ (2) $-1 < a < 0$ (3) $a \geq 0$ (4) $a > 0$ or $a < -1$

Q.32 The number of integer values of a for which the solution of the equation $3x - 6y = 1$ and $5x - ay = 2$ satisfies the condition of $x \leq 0$ and $y \leq 0$ is -

(1) Three (2) One (3) Two (4) None of these

Q.33 The least positive integer satisfying $|x - 6| < x^2 - 5x + 9$ is -

(1) 1 (2) 3 (3) 4 (4) None of these

Q.34 The solution of the equation $(5 + 2\sqrt{6})^{x^2 - 3} + (5 - 2\sqrt{6})^{x^2 - 3} = 10$ is -

(1) $x = \pm 2, \pm \sqrt{2}$ (2) $x = \pm 3, \pm \sqrt{3}$ (3) $x = \pm 1, \pm \sqrt{3}$ (4) None of these

Q.35 Let x_1, x_2 be the roots of the equation $x^2 - 3x + p = 0$ and let x_3, x_4 be the roots of equations $x^2 - 12x + q = 0$. If the numbers x_1, x_2, x_3, x_4 (in order) form an increase GP, then -

(1) p = 2, q = 16 (2) p = 2, q = 32 (3) p = 4, q = 16 (4) p = 4, q = 32

Q.36 The number of real solutions of the equation $\left(\frac{9}{10}\right)^x = -3 + x - x^2$ is -

(1) More than two (2) One (3) Two (4) None of these

Q.37 The least integral value of a for which the equation $x^2 - 2(a - 1)x + (2a + 1) = 0$ has both the roots positive is

(1) 3 (2) 4 (3) 1 (4) 5

Q.38 The value of k for which the equation $3x^2 + 2x(k^2 + 1) + k^2 - 3k + 2 = 0$ has roots of opposite signs, lies in the interval

(1) $(-\infty, 0)$ (2) $(-\infty, -1)$ (3) (1, 2) (4) (3/2, 2)

Q.39 If $3^{2x} - 3^{x-1} - 3^{x-1} + 1 = 0$ then x =

(1) 3,1/3 (2) 1,–1 (3) 3, – 1/3 (4) 3, 1

Q.40 If $x = 2 + 2^{2/3} + 2^{1/3}$ then the value of $x^3 - 6x^2 + 6x$ is -

(1) 3 (2) 2 (3) 1 (4) None of these

Q.41 If one root of the equation $ax^2 + bx + c = 0$ is reciprocal of the one root of the equation $a_1x^2 + b_1x + c_1 = 0$ then

(1) $(aa - cc_1)^2 = (bc_1 - b_1a)(b_1c - a_1b)$ (2) $(ab_1 - a_1b)^2 = (bc_1 - b_1c)(a_1c - c_1a)$

(3) $(bc_1 - cb_1)^2 = (ca_1 - a_1c)(b_1a - a_1b)$ (4) None of these

Q.42 If one root of the equation $\frac{1}{x+a} + \frac{1}{x+b} = \frac{1}{c}$ are equal in magnitude but opposite in sign then their product is -

(1) $\frac{1}{2}(a^2 + b^2)$ (2) $-\frac{1}{2}(a^2 + b^2)$ (3) $\frac{1}{2}ab$ (4) $-\frac{1}{2}ab$

Q.43 If the ratio of the roots of the equation $x^2 + px + q = 0$ be equal to the ratio of the roots of $x^2 + lx + m = 0$, then

(1) $p^2m = q^2l$ (2) $pm^2 = q^2l$ (3) $p^2l = q^2m$ (4) $p^2m = 1^2q$

Q.44 If $x^2 - x + 1 = 0$, then the value of x^{3n} is (where n is natureal number)

(1) – 1, 1 (2) 1 (3) – 1 (4) 0

Q.45 If $\frac{x^2 + 2x + 7}{2x + 3} < 6$, $x \in R$, then

(1) $x > 11$ or $x < -\frac{3}{2}$ (2) $x > 11$ or $x < -1$

(3) $-\frac{3}{2} < x < -1$ (4) $-1 < x < 11$ or $x < -\frac{3}{2}$

Q.46 The number of solutions of the system of equations $3\log_3 |-x| = \log_3 x^2$ is :

(1) Three (2) One (3) Two (4) None of these

Q.47 The number of solutions of the system of equation $x + 2y = 6$, $|x - 3| = y$ is -

(1) 0 (2) 1 (3) 2 (4) None of these

Q.48 If $a + b + c = 0$, then the roots of the equation $3ax^2 + 4bx + 5c = 0$ are -

(1) Positive (2) Negative (3) Real and distinct (4) Imaginary

Q.49 Given that a, b are integers and both are roots of the equation $x^2 + ax + b = 0$ are rational, then the roots are -

(1) Positive (2) Negavite (3) Integral (4) Fractional

Q.50 The roots of the equation $a(x - b)(x - c) + b(x - c)(x - a) + (x - a)(x - b) = 0$ are always

(1) Positive (2) Negative (3) Real (4) Unreal

Q.51 If the sum of the roots of the equation $ax^2 + bx + c = 0$ is equal to the sum of the square of their reciprocal, then -

(1) c^2b, a^2c, b^2a are in AP (2) c^2b, a^2c, b^2a are in GP

(3) $\frac{b}{c}, \frac{a}{b}, \frac{c}{a}$ are in HP (4) $\frac{b}{c}, \frac{a}{b}, \frac{c}{a}$ are in GP

Q.52 The solution of the inequality $\log_3 \left(\frac{x^2 - 4x + 3}{x^2 + |x - 5|}\right) \geq 0$ is -

(1) $\{x ; x \leq 0\}$ (2) $\{x : x \geq 5\}$

(3) $\left\{x; x \in \left(-\infty, \frac{-2}{3}\right] \cup \left[\frac{1}{2}, 2\right]\right\}$ (4)None of these

Q.53 If the equation $ax^2 + 2bx + c = 0$, $dx^2 + 2ex + f = 0$ have a common root and the second equation has equal roots, then

(1) abc = def (2) $\frac{a}{d}, \frac{d}{e}, \frac{c}{f}$ are in AP

(3) $\frac{a}{d}, \frac{d}{e}, \frac{c}{f}$ are in GP (4) None of these

Q.54 One of the roots of the equation $(4a + 1)x^2 - 2ax + 2a - 4 = 0$ is greater than 2 and the other smaller than 2. Then

(1) a can assume any positive value (2) $-\frac{1}{4} < a < 0$

(3) $-\frac{1}{2} < a < -\frac{1}{4}$ (4) None of these

Q.55 If $a^4 + b^4 + c^4 + a^2b^2 + b^2c^2 + c^2a^2 = 2abc\ (a + b + c)$ and a, b, c are all real, then

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

Q.56 Let x and y be two natural numbers satisfying the conditions xy = 12 (x + y) and ≤ y. Then the toatal number of pairs (x, y) is -

(1) 4 (2) 6 (3) 8 (4) None of these

Q.57 If a < b<c<d. Then the roots of the equations (x – a) (x – c) – 3 (x – b) (x – d) = 0

(1) real (2) unreal (3) rational (4) Irrational

Q.58 The roots of the quadratic equation $abc^2x^2 + 3a^2cx + b^2cx - 6a^2 - ab + 2b^2 = 0$ are

(1) Rational (2) Irrational (3) Positive (4) Negative

Q.59 The solution of the equation $x + \log_{10}(1 + 2^x) = x \log_{10} 5 + \log_{10} 6$ is -

(1) $x = 0$ (2) $x = 1$ (3) $x = 2$ (4) $x = 3$

Q.60 If the quadratic equations $3x^2 + ax + 1 = 0$ and $2x^2 + bx + 1 = 0$ have a common root, then the value of the expression $5ab - 2a^2 - 3b^2$ is -

(1) 0 (2) 1 (3) – 1 (4) None of these

Q.61 The equation $x + \log (1 + 2^x) = x \log 5 + \log 6$ has

(1) No solution (2) One solution (3) Two solution (4) Three solution

Q.62 The solution of $\sqrt{2x+7} + \sqrt{3x-18} = \sqrt{7x+1}$ is/ are-

(1) $x = 9$ (2) $x = 1$ & $= 9$ (3) $x = 2$ & $x = 1$ (4) $x = 9$ & $x = 18/5$

Q.63 The number of integral roots of the equation $\sqrt{(x+3) - 4\sqrt{x+1}} + \sqrt{(x+8) - 6\sqrt{x-1}} = 1$ is-

(1) 6 (2) 4 (3) 5 (4) None of these

Q.64 If x be real, and $y = x + \frac{1}{x-1}$, then y cannot lie between

(1) 2 & 4 (2) 4 & 5 (3) 1 & 3 (4) None of these

Q.65 The number of real solutions of the sysem of equations $\left.\begin{matrix} |x|+|y|=1 \\ x^2+y^2=1 \end{matrix}\right\}$ are -

(1) 2 (2) 4 (3) 6 (4) None of these

Q.66 Let the symbol log stand for logarithm to the base 10. Then the equation $5^{\log x} = 50 - x^{\log 5}$ has

(1) No real solution (2) One real solution (3) Two real solution (4) Infinite solution

Q.67 Let the symbol log stand for logarithm to the base 10. Then the equation log (log x) + log (log $x^3 - 2$) = 0 has -

(1) No real solution (2) One real solution (3) Two real solution (4) Infinite solutions

Q.68 Let a, b, c be real numbers, $a \neq 0$. If α is a root of $a^2x^2 + bx + c = 0$, β is root of $a^2x^2 - bx - c = 0$ and $0 < \alpha < \beta$, then the equation $a^2x^2 - bx - c = 0$ and $0 < \alpha < \beta$, then the equation $a^2x^2 + 2bx + 2c = 0$ has a root γ that always satisfies :

(1) $\gamma = \frac{\alpha+\beta}{2}$ (2) $\gamma = \alpha + \frac{\beta}{2}$ (3) $\gamma = \alpha$ (4) $\alpha < \gamma < \beta$

Q.69 If $x^2 + x + 1$ is a factor of $ax^3 + bx^2 + cx + d$, then the real root of $ax^3 + bx^2 + cx + d = 0$ is-

(1) $-\frac{d}{a}$ (2) $\frac{d}{a}$ (3) $\frac{a}{d}$ (4) None of these

Q.70 If $0 < a < b < c$ and the roots α, β of the equation $ax^2 + bx + c = 0$ are imaginary, then-

(1) $|\alpha| > |\beta|$ (2) $|\alpha| > 1$ (3) $|\beta| < 1$ (4) None of these

Q.71 Let $p, q \in \{1, 2, 3, 4\}$, the number of equations of the form $px^2 + qx + 1 = 0$ having real roots is-

(1) 15 (2) 12 (3) 9 (4) 7

Q.72 If a, b, c are real and $x^3 - 3b^2 x + 2c^3$ is divisible by $x - a$ and $x - b$, then-

(1) $a = -b = -c$ (2) $a = 2b = 2c$

(3) $a = b = c$ or $a = -2b = -2c$ (4) None of these

Q.73 The equation $(x - a)^3 + (x - b)^3 + (x - c)^3 = 0$ has-

(1) All the roots real (2) One real and two imaginary roots

(3) Three real roots namely $x = a, x = b, x = c$ (4) None of these

Q.74 The value of 'a' for which exactly one root of the equation $e^a x^2 - e^{2a} x + e^a - 1 = 0$, lies between 1 and 2 are given by-

(1) $\text{In}\left(\frac{5-\sqrt{17}}{4}\right) < a < \text{In}\left(\frac{5+\sqrt{17}}{4}\right)$ (2) $0 < a < 100$

(3) $\text{In}\frac{5}{4} < a < \text{In}\frac{10}{3}$ (4) None of these

Q.75 If ω is a complex cube root of unity and a, b, c are three real numbers such that $\frac{1}{a+\omega} + \frac{1}{b+\omega} + \frac{1}{c+\omega} = 2\omega^2$ and $\frac{1}{a+\omega^2} + \frac{1}{b+\omega^2} + \frac{1}{c+\omega^2} = 2\omega$. Then $\frac{1}{a+1} + \frac{1}{b+1} + \frac{1}{c+1}$ is-

(1) 2 (2) 1 (3) 0 (4) None of these

Q.76 The roots of the equation $(x^2 + 2)^2 + 8x^2 = 6x(x^2 + 2)$ are-

(1) $x = 1 \pm o$ (2) $x = 2 \pm \sqrt{2}$ (3) $x = 1 \pm 2\sqrt{2}i$ (4) None of these

Q.77 Let a, b, c be real. If $ax^2 + bx + c = 0$ has two real roots α and β, where $\alpha < -2$ and $\beta > 2$, then-

(1) $4 - \frac{2b}{a} + \frac{c}{a} < 0$ (2) $4 + \frac{2b}{a} + \frac{c}{a} < 0$ (3) $4 - \frac{2b}{a} + \frac{c}{a} = 0$ (4) $4 + \frac{2b}{a} + \frac{c}{a} = 0$

Q.78 What statement is true for the equation $x^2 + \frac{x^2}{(x+1)^2} = 3$?

(1) Two real roots
(2) Two imaginary roots
(3) Nothing can be said
(4) None of these

Q.79 Let Δ be the discriminant and α, β be the roots of the equation $ax^2 + bx + c = 0$. then $2a\alpha + \Delta$ and $2a\beta - \Delta$ can be the roots of the equation :

(1) $x^2 + 2bx + b^2 = 0$
(2) $x^2 - 2bx + b^2 = 0$
(3) $x^2 - 2bx - 3b^2 + 16ac = 0$
(4) None of these

Q.80 The value of x satisfying the equation $10^{2/x} + 25^{1/x} = (4.25)\,(50^{1/x})$ is-

(1) $\frac{1}{2}$
(2) $-\frac{1}{4}$
(3) 2
(4) – 2.