### 1. The value of $a$ for which the sum of the squares of the roots of the equation $x^2 - (a - 2)x - a - 1 = 0$ assume the least value is

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

[AIEEE 2005]

### 2. If the roots of the equation $x^2 - bx + c = 0$ be two consecutive integers, then $b^2 - 4c$ equals

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

[AIEEE 2005]

### 3. If both the roots of the quadratic equation $x^2 - 2kx + k^2 + k - 5 = 0$ are less than 5, then $k$ lies in the interval

- (a) $(5, 6]$ 
- (b) $(6, \infty)$ 
- (c) $(-\infty, 4)$ 
- (d) $[4, 5]$

[AIEEE 2005]

### 4. Let two numbers have arithmetic mean 9 and geometric mean 4. Then these numbers are the roots of the quadratic equation

- (a) $x^2 + 18x + 16 = 0$
- (b) $x^2 - 18x + 16 = 0$
- (c) $x^2 + 18x - 16 = 0$
- (d) $x^2 - 18x - 16 = 0$

[AIEEE 2004]

### 5. If $(1 - p)$ is a root of quadratic equation $x^2 + px + (1 - p) = 0$, then the roots are

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

[AIEEE 2004]

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

- (a) $\frac{49}{4}$
- (b) 12
- (c) 3
- (d) 4

[AIEEE 2004]

### 7. The number of real solutions of the equation $x^2 - 3|x| + 2 = 0$ is

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

[AIEEE 2003]
(8) The value of ‘a’ for which one root of quadratic equation
\[(a^2 - 5a + 3)x^2 + (3a - 1)x + 2 = 0\]
is twice as large as the other is

(a) \(\frac{2}{3}\)  (b) \(-\frac{2}{3}\)  (c) \(\frac{1}{3}\)  (d) \(-\frac{1}{3}\)  [AIEEE 2003]

(9) If roots of the equation \(x^2 - 5x + 16 = 0\) are \(\alpha, \beta\) and roots of the equation
\(x^2 + px + q = 0\) are \(\alpha^2 + \beta^2\) and \(\frac{\alpha\beta}{2}\), then

(a) \(p = 1\) and \(q = -56\)  (b) \(p = -1\) and \(q = -56\)
(c) \(p = 1\) and \(q = 56\)  (d) \(p = -1\) and \(q = 56\)  [AIEEE 2002]

(10) If \(\alpha\) and \(\beta\) be the roots of the equation \((x - a)(x - b) = c, c \neq 0\), then the roots
of the equation \((x - \alpha)(x - \beta) = c\) are

(a) \(a\) and \(c\)  (b) \(b\) and \(c\)
(c) \(a\) and \(b\)  (d) \((a + b)\) and \((b + c)\)  [AIEEE 2002, IIT 1992]

(11) If one root of the equation \(x^2 + px + q = 0\) is square of the other, then for any \(p\)
and \(q\) it will satisfy the relation

(a) \(p^3 - q(3p - 1) + q^2 = 0\)  (b) \(p^3 - q(3p + 1) + q^2 = 0\)
(c) \(p^3 + q(3p - 1) + q^2 = 0\)  (d) \(p^3 + q(3p + 1) + q^2 = 0\)  [IIT 2004]

(12) If \(x^2 + 2ax + 10 - 3a > 0\) for every real value of \(x\), then

(a) \(a > 5\)  (b) \(a < -5\)  (c) \(-5 < a < 2\)  (d) \(2 < a < 5\)  [IIT 2004]

(13) If minimum value of \(f(x) = x^2 + 2bx + 2c^2\) is greater than the maximum value of
\(g(x) = -x^2 - 2cx + b^2\), then for real value of \(x\)

(a) \(|c| > |b|\sqrt{2}\)  (b) \(|c|\sqrt{2} > b\)
(c) \(0 < c < \sqrt{2}b\)  (d) no real value of \(a\)  [IIT 2003]

(14) The set of all real numbers \(x\) for which \(x^2 - |x + 2| + x > 0\), is

(a) \((-\infty, -2) \cup (2, \infty)\)  (b) \((-\infty, -\sqrt{2}) \cup (\sqrt{2}, \infty)\)
(c) \((-\infty, -1) \cup (1, \infty)\)  (d) \((\sqrt{2}, \infty)\)  [IIT 2002]
04 - QUADRATIC EQUATIONS
(Answers at the end of all questions)

(15) The number of solutions of $\log_4 (x - 1) = \log_2 (x - 3)$ is
(a) 3          (b) 1          (c) 2          (d) 0 [IIT 2001]

(16) If $\alpha$ and $\beta$ are the roots of the equation $x^2 + bx + c = 0$, where $c < 0 < b$, then
(a) $0 < \alpha < \beta$          (b) $\alpha < 0 < \beta < |\alpha|$          (c) $\alpha < \beta < 0$          (d) $\alpha < 0 < |\alpha| < \beta$ [IIT 2000]

(17) For the equation $3x^2 + px + 3 = 0$, $p > 0$, if one of the roots is square of the other, then $p$ is equal to
(a) $\frac{1}{3}$          (b) 1          (c) 3          (d) $\frac{2}{3}$ [IIT 2000]

(18) If $b > a$, the equation $(x - a)(x - b) - 1 = 0$ has
(a) both roots in $(a, b)$          (b) one root in $(\infty, a)$ and the other in $(b, \infty)$
(c) both roots in $(b, \infty)$          (d) both roots in $(\infty, a)$ [IIT 2000]

(19) The harmonic mean of the roots of the equation $(5 + \sqrt{2})x^2 - (4 + \sqrt{5})x + 8 + 2\sqrt{5} = 0$ is
(a) 2          (b) 4          (c) 6          (d) 8 [IIT 1999]

(20) If the roots of the equation $x^2 - 2ax + a^2 + a - 3 = 0$ are real and less than 3, then
(a) $a < 2$          (b) $2 \leq a \leq 3$          (c) $3 < a \leq 4$          (d) $a > 4$ [IIT 1999]

(21) The equation $\sqrt{x + 1} - \sqrt{x - 1} = \sqrt{4x - 1}$ has
(a) no solution          (b) one solution
(c) two solutions          (d) more than two solutions [IIT 1997]
(22) If \( p, q, r \) are positive and are in A.P., then the roots of the quadratic equation \( px^2 + qx + r = 0 \) are real for

(a) \( \left| \frac{r}{p} - 7 \right| \geq 4\sqrt{3} \)  
(b) \( \left| \frac{p}{r} - 7 \right| \geq 4\sqrt{3} \)

(c) all \( p \) and \( r \)  
(d) no \( p \) and \( r \)  
[IIT 1995]

(23) Let \( f(x) \) be a quadratic expression which is positive for all real \( x \). If \( g(x) = f(x) + f'(x) + f''(x) \), then for any real \( x \)

(a) \( g(x) < 0 \)  
(b) \( g(x) > 0 \)  
(c) \( g(x) = 0 \)  
(d) \( g(x) \geq 0 \)  
[IIT 1990]

(24) If \( \alpha \) and \( \beta \) are the roots of \( x^2 + px + q = 0 \) and \( \alpha^4 \) and \( \beta^4 \) are the roots of \( x^2 - qx + s = 0 \), then the equation \( x^2 - 4qx + 2q^2 - r = 0 \) has always

(a) two real roots  
(b) two positive roots  
(c) two negative roots  
(d) one positive and one negative root  
[IIT 1989]

(25) Let \( a, b, c \) be real numbers, \( a \neq 0 \). If \( \alpha \) is a root of \( a^2 x^2 + bx + c = 0 \), \( \beta \) is a root of \( a^2 x^2 - bx - c = 0 \) and \( 0 < \alpha < \beta \), then the equation \( a^2 x^2 + 2bx + 2c = 0 \) has a root \( \gamma \) that always satisfies

(a) \( \gamma = \frac{\alpha + \beta}{2} \)  
(b) \( \gamma = \alpha + \frac{\beta}{2} \)  
(c) \( \gamma = \alpha \)  
(d) \( \alpha < \gamma < \beta \)  
[IIT 1989]

(26) The equation \( \frac{3}{2} (\log_2 x)^2 + \log_2 x - \frac{5}{4} = \sqrt{2} \) has

(a) at least one real solution  
(b) exactly three real solutions  
(c) exactly one irrational solution  
(d) complex roots  
[IIT 1989]

(27) The equation \( x - \frac{2}{x - 1} = 1 - \frac{2}{x - 1} \) has

(a) no root  
(b) one root  
(c) two equal roots  
(d) infinitely many roots  
[IIT 1984]

(28) For real \( x \), the function \( \frac{(x - a)(x - b)}{(x - c)} \) will assume all real values provided

(a) \( a > b > c \)  
(b) \( a > b > c \)  
(c) \( a > c > b \)  
(d) \( a < c < b \)  
[IIT 1984]
(29) If $a + b + c = 0$, then the quadratic equation $3ax^2 + 2bx + c = 0$ has

(a) at least one root in $[0, 1]$
(b) one root in $[2, 3]$ and the other in $[-2, -1]$
(c) imaginary roots
(d) none of these

[IIT 1983]

(30) The number of real solutions of the equation $|x|^2 - 3|x| + 2 = 0$ is

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

[IIT 1982]

(31) If $a > 0$, $b > 0$ and $c > 0$, then both the roots of the equation $ax^2 + bx + c = 0$

(a) are real and negative
(b) have negative real parts
(c) none of these

[IIT 1980]

(32) Both the roots of the equation $(x - b)(x - c) + (x - a)(x - c) + (x - a)(x - b) = 0$

are always

(a) positive
(b) negative
(c) real
(d) none of these

[IIT 1980]

(33) If $l$, $m$, $n$ are real, $l \neq m$, then the roots of the equation

$(l - m)x^2 - 5(l + m)x - 2(l - m) = 0$

are

(a) real and equal
(b) complex
(c) real and unequal
(d) none of these

[IIT 1979]

(34) The entire graph of the equation $y = x^2 + kx - x + 9$ is strictly above the X-axis if and only if

(a) $k < 7$
(b) $-5 < k < 7$
(c) $k > -5$
(d) none of these

[IIT 1979]

(35) If $\alpha$ and $\beta$ are roots of the equation $ax^2 + bx + c = 0$, then

$(1 + \alpha + \alpha^2)(1 + \beta + \beta^2) =$

(a) 0
(b) positive
(c) negative
(d) none of these
(36) If the two equations \( ax^2 + bx + c = 0 \) and \( px^2 + qx + r = 0 \) have a common root, then the value of \( (aq - bp)(br - cq) \) is

(a) \(- (ar - cp)^2\)  
(b) \((ap - cr)^2\)  
(c) \((ac - pr)^2\)  
(d) \((ar - cp)^2\)

(37) The set of values of \( p \) for which the roots of the equation \( 3x^2 + 2x + p(p - 1) = 0 \) are of opposite signs is

(a) \((-\infty, 0)\)  
(b) \((0, 1)\)  
(c) \((1, \infty)\)  
(d) \((0, \infty)\)

(38) If the roots of the equation \( a(b - c)x^2 + b(c - a)x + c(a - b) = 0 \) are equal, then \( a, b, c \) are in

(a) H.P.  
(b) G.P.  
(c) A.P.  
(d) none of these

(39) The value of \( p \) for which the difference between the roots of the equation \( x^2 + px + 8 = 0 \) is 2 are

(a) \(\pm 2\)  
(b) \(\pm 4\)  
(c) \(\pm 6\)  
(d) \(\pm 8\)

(40) If \( a > 0 \), then \( \sqrt{a} + \sqrt{a + \sqrt{a + \ldots \infty}} = \)

(a) \(\frac{1}{2}\sqrt{4a - 1}\)  
(b) \(\frac{1}{2}\left[1 + \sqrt{4a - 1}\right]\)  
(c) \(\frac{1}{2}\left[1 - \sqrt{4a - 1}\right]\)  
(d) none of these

(41) If for the quadratic equation \( ax^2 + bx + c = 0 \), the difference of the roots is the same as their product, then the ratio of the roots is

(a) \(\frac{a - b}{a + b}\)  
(b) \(\frac{b - c}{b + c}\)  
(c) \(\frac{c - a}{c + a}\)  
(d) none of these

(42) The integral values of \( m \) for which the roots of the equation \( mx^2 + (2m - 1)x + (m - 2) = 0 \) are rational for rational \( k \) are given by

(a) \(k(k + 1)\)  
(b) \(\frac{k^2 - 1}{4}\)  
(c) \(\frac{k(k + 2)}{4}\)  
(d) none of these
(43) If $x^2 + 6x - 27 > 0$ and $-x^2 + 3x + 4 > 0$, the $x$ lies in the interval

- $a)$ $(3, 4)$
- $b)$ $[3, 4)$
- $c)$ $(-9, 3] \cup [4, 9)$
- $d)$ $(-9, 4)$

(44) The roots of the equation $\log_{7} (x^2 - 4x + 5) = x - 1$ are

- $a)$ $2, 3$
- $b)$ $7$
- $c)$ $-2, -3$
- $d)$ $2, -3$

(45) If $2, 3$ are roots of the equation $2x^3 + mx^2 - 13x + n = 0$, then the values of $m$ and $n$ are

- $a)$ $-5, -30$
- $b)$ $-5, 30$
- $c)$ $5, 30$
- $d)$ none of these

(46) If $\sin \alpha$ and $\cos \alpha$ are the roots of the equation $ax^2 + bx + c = 0$, then

- $a)$ $a^2 + b^2 - 2ac = 0$
- $b)$ $a^2 - b^2 + 2ac = 0$
- $c)$ $(a + c)^2 = b^2 + c^2$
- $d)$ $(a - c)^2 = b^2 + c^2$

(47) If the equations $ax^2 + 2cx + b = 0$ and $ax^2 + 2bx + c = 0$ ($b \neq c$) have a common root, then $a + 4b + 4c =$

- $a)$ $0$
- $b)$ $1$
- $c)$ $-1$
- $d)$ none of these

**Answers**

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