EXERCISE - 01 CHECK YOUR GRASP

SELECT THE CORRECT ALTERNATIVE (ONLY ONE CORRECT ANSWER)

1. The roots of the quadratic equation $(a + b - 2c)x^2 - (2a - b - c)x + (a - 2b + c) = 0$ are -

(A) $a + b + c$ & $a - b + c$
(B) $1/2$ & $a - 2b + c$
(C) $a - 2b + c$ & $1/(a + b - 2c)$
(D) none of these

2. If the A.M. of the roots of a quadratic equation is $\frac{8}{5}$ and A.M. of their reciprocals is $\frac{8}{7}$, then the quadratic equation is -

(A) $5x^2 - 8x + 7 = 0$ (B) $5x^2 - 16x + 7 = 0$ (C) $7x^2 - 16x + 5 = 0$ (D) $7x^2 + 16x + 5 = 0$

3. If $\sin\alpha$ & $\cos\alpha$ 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) $a^2 - b^2 - 2ac = 0$
(D) $a^2 + b^2 - 2ac = 0$

4. If one root of the quadratic equation $px^2 + qx + r = 0$ $(p \neq 0)$ is a surd $\frac{\sqrt{a}}{\sqrt{a}+\sqrt{a-b}}$, where p, q, r; a, b are all rationals then the other root is -

(A) $\frac{\sqrt{b}}{\sqrt{a}-\sqrt{a-b}}$
(B) $a + \frac{\sqrt{a(a-b)}}{b}$
(C) $\frac{a+\sqrt{a(a-b)}}{b}$
(D) $\frac{\sqrt{a}-\sqrt{a-b}}{\sqrt{b}}$

5. A quadratic equation with rational coefficients one of whose roots is $\tan\left(\frac{\pi}{12}\right)$ is -

(A) $x^2 - 2x + 1 = 0$ (B) $x^2 - 2x + 4 = 0$ (C) $x^2 - 4x + 1 = 0$ (D) $x^2 - 4x - 1 = 0$

6. $ax^2 + bx + c = 0$ has real and distinct roots α and $\beta(\beta > \alpha)$. Further $a > 0$, $b < 0$ and $c < 0$, then -

(A) $0 < \beta < |\alpha|$ (B) $0 < |\alpha| < \beta$ (C) $\alpha + \beta < 0$ (D) $|\alpha| + |\beta| = \left|\frac{b}{a}\right|$

7. If the roots of $(a^2 + b^2)x^2 - 2b(a + c)x + (b^2 + c^2) = 0$ are equal then a, b, c are in

(A) A.P. (B) G.P. (C) H.P. (D) none of these

8. If $a(b - c)x^2 + b(c - a)x + c(a - b) = 0$ has equal root, then a, b, c are in

(A) A.P. (B) G.P. (C) H.P. (D) none of these

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

(A) 15 (B) 9 (C) 7 (D) 8

10. If the roots of the quadratic equation $ax^2 + bx + c = 0$ are imaginary then for all values of a, b, c and $x \in R$, the expression $a^2x^2 + abx + ac$ is -

(A) positive
(B) non-negative
(C) negative
(D) may be positive, zero or negative

11. If x, y are rational number such that $x + y + (x - 2y)\sqrt{2} = 2x - y + (x - y - 1)\sqrt{6}$, then

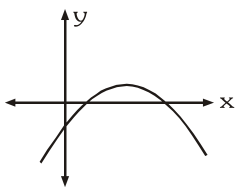
(A) x and y connot be determined
(B) $x = 2, y = 1$
(C) $x = 5, y = 1$
(D) none of these

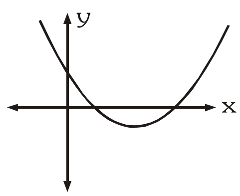
12. Graph of the function $f(x) = Ax^2 - BX + C$, where

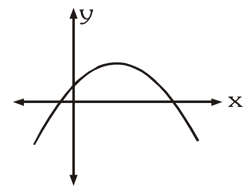
$A = (\sec\theta - \cos\theta)(\text{cosec}\theta - \sin\theta)(\tan\theta + \cot\theta)$,

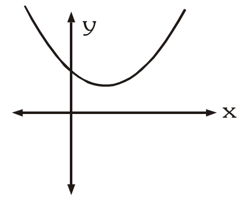
$B = (\sin\theta + \text{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 - (\tan^2\theta + \cot^2\theta)$ &

$C = 12$, is represented by

(A) 

(B) 

(C) 

(D) 

13. The equation whose roots are the squares of the roots of the equation $ax^2 + bx + c = 0$ is -

(A) $a^2x^2 + b^2x + c^2 = 0$ (B) $a^2x^2 - (b^2 - 4ac)x + c^2 = 0$

(C) $a^2x^2 - (b^2 - 2ac)x + c^2 = 0$ (D) $a^2x^2 + (b^2 - ac)x + c^2 = 0$

14. If $\alpha \neq \beta$, $\alpha^2 = 5\alpha - 3$, $\beta^2 = 5\beta - 3$, then the equation whose roots are α/β & β/α, is

(A) $x^2 + 5x - 3 = 0$ (B) $3x^2 + 12x + 3 = 0$ (C) $3x^2 - 19x + 3 = 0$ (D) none of these

15. If α, β are the roots of the equation $x^2 - 3x + 1 = 0$, then the equation with roots $\frac{1}{\alpha - 2}, \frac{1}{\beta - 2}$ will be

(A) $x^2 - x - 1 = 0$ (B) $x^2 + x - 1 = 0$ (C) $x^2 + x + 2 = 0$ (D) none of these

16. If $x^2 - 11x + a$ and $x^2 - 14x + 2a$ have a common factor then 'a' is equal to

(A) 24 (B) 1 (C) 2 (D) 12

17. The smallest integer x for which the inequality $\frac{x-5}{x^2 + 5x - 14} > 0$ is satisfied is given by -

(A) – 7 (B) – 5 (C) – 4 (D) – 6

18. The number of positive integral solutions of the inequation $\frac{x^2(3x-4)^3\ (x-2)^4}{(x-5)^5\ (2x-7)^6} \leq 0$ is -

(A) 2 (B) 0 (C) 3 (D) 4

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

(A) 1 (B) 3/2 (C) 2 (D) – 1

20. If the roots of the quadratic equation $x^2 + 6x + b = 0$ are real and distinct and they differ by atmost 4 then the least value of b is -

(A) 5 (B) 6 (C) 7 (D) 8

21. The expression $\frac{x^2 + 2x + 1}{x^2 + 2x + 7}$ lies in the interval ; $(x \in R)$ -

(A) $[0, -1]$ (B) $(-\infty, 0] \cup [1, \infty)$ (C) $[0, 1)$ (D) none of these

22. If the roots of the equation $x^2 - 2ax + a^2 + a - 3 = 0$ are real & less than 3 then -

(A) $a < 2$ (B) $2 \leq a \leq 3$ (C) $3 < a \leq 4$ (D) $a > 4$

23. The number of integral values of m, for which the roots of $x^2 - 2mx + m^2 - 1 = 0$ will lie between – 2 and 4 is -

(A) 2 (B) 0 (C) 3 (D) 1

24. If the roots of the equation, $x^3 + Px^2 + Qx - 19 = 0$ are each one more than the roots of the equation, $x^3 - Ax^2 + Bx - C = 0$, where A, B, C, P & Q are constants then the value of A + B + C =

(A) 18 (B) 19 (C) 20 (D) none

25. If $\alpha, \beta, \gamma, \delta$ are roots of $x^4 - 100x^3 + 2x^2 + 4x + 10 = 0$, then $\frac{1}{\alpha} + \frac{1}{\beta} + \frac{1}{\gamma} + \frac{1}{\delta}$ is equal to -

(A) $\frac{2}{5}$ (B) $\frac{1}{10}$ (C) 4 (D) $-\frac{2}{5}$

26. Number of real solutions of the equation $x^4 + 8x^2 + 16 = 4x^2 - 12x + 9$ is equal to -

(A) 1 (B) 2 (C) 3 (D) 4

27. The complete solution set of the inequation $\sqrt{x+18} < 2 - x$ is -

(A) $[-18, -2]$ (B) $(-\infty, -2) \cup (7, \infty)$ (C) $(-18, 2) \cup (7, \infty)$ (D) $[-18, -2)$

28. If $\log_{1/3}\frac{3x-1}{x+2}$ is less than unity then x must lie in the interval -

(A) $(-\infty, -2) \cup (5/8, \infty)$ (B) $(-2, 5/8)$

(C) $(-\infty, -2) \cup (1/3, 5/8)$ (D) $(-2, 1/3)$

29. Exhaustive set of value of x satisfying $\log_{|x|}(x^2 + x + 1) \geq 0$ is -

(A) $(-1, 0)$ (B) $(-\infty, 1) \cup (1, \infty)$

(C) $(-\infty, \infty) - \{-1, 0, 1\}$ (D) $(-\infty, -1) \cup (-1, 0) \cup (1, \infty)$

30. Solution set of the inequality, $2 - \log_2(x^2 + 3x) \geq 0$ is -

(A) $[-4, 1]$ (B) $[-4, -3) \cup (0, 1]$ (C) $(-\infty, -3) \cup (1, \infty)$ (D) $(-\infty, -4) \cup [1, \infty)$

SELECT THE CORRECT ALTERNATIVES (ONE OR MORE THAN ONE CORRECT ANSWERS)

31. If α is a root of the equation $2x(2x + 1) = 1$, then the other root is -

(A) $3\alpha^3 - 4\alpha$ (B) $-2\alpha(\alpha + 1)$ (C) $4\alpha^3 - 3\alpha$ (D) none of these

32. If $b^2 \geq 4ac$ for the equation $ax^4 + bx^2 + c = 0$, then all roots of the equation will be real if -

(A) $b > 0, a < 0, c > 0$ (B) $b < 0, a > 0, c > 0$

(C) $b > 0, a > 0, c > 0$ (D) $b > 0, a < 0, c < 0$

33. Let α, β be the roots of $x^2 - ax + b = 0$, where a & b $\in$ R. If $\alpha + 3\beta = 0$, then -

(A) $3a^2 + 4b = 0$ (B) $3b^2 + 4a = 0$ (C) $b < 0$ (D) $a < 0$

34. For $x \in [1, 5]$, $y = x^2 - 5x + 3$ has -

(A) least value = -1.5 (B) greatest value = 3

(C) least value = -3.25 (D) greatest value = $\frac{5+\sqrt{13}}{2}$

35. Integral real values of x satisfying $\log_{1/2}(x^2 - 6x + 12) \geq -2$ is -

(A) 2 (B) 3 (C) 4 (D) 5

36. If $\frac{1}{2} \leq \log_{0.1} x \leq 2$, then -

(A) the maximum value of x is $\frac{1}{\sqrt{10}}$ (B) x lies between $\frac{1}{100}$ and $\frac{1}{\sqrt{10}}$

(C) x does not lie between $\frac{1}{100}$ and $\frac{1}{\sqrt{10}}$ (D) the minimum value of x is $\frac{1}{100}$

CHECK YOUR GRASP **ANSWER KEY** EXERCISE-1

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	D	B	A	C	C	B	B	C	C	A
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	B	B	C	C	A	A	D	C	B	A
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	C	A	C	A	D	A	D	A	D	B
Que.	31	32	33	34	35	36				
Ans.	B,C	B,D	A,C	B,C	A,B,C	A,B,D				

EXERCISE - 02

BRAIN TEASERS

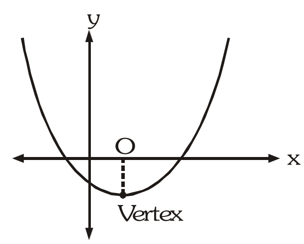
SELECT THE CORRECT ALTERNATIVES (ONE OR MORE THAN ONE CORRECT ANSWERS)

1. The equation whose roots are $\sec^2\alpha$ & $\text{cosec}^2\alpha$ can be -
(A) $2x^2 - x - 1 = 0$ (B) $x^2 - 3x + 3 = 0$ (C) $x^2 - 9x + 9 = 0$ (D) $x^2 + 3x + 3 = 0$

2. If $\cos\alpha$ is a root of the equation $25x^2 + 5x - 12 = 0$, $-1 < x < 0$, then the value of $\sin 2\alpha$ is -
(A) 12/25 (B) – 12 / 25 (C) – 24 / 25 (D) 24 / 25

3. If the roots of the equation $\frac{1}{x+p}+\frac{1}{x+q}=\frac{1}{r}$ are equal in magnitude and opposite in sign, then -
(A) $p + q = r$ (B) $p + q = 2r$
(C) product of roots = $-\frac{1}{2}(p^2+q^2)$ (D) sum of roots = 1

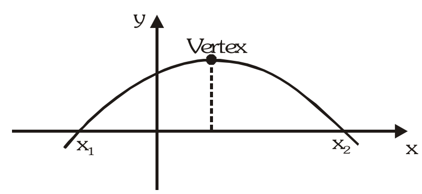
4. Graph of $y = ax^2 + bx + c = 0$ is given adjacently. What conclusions can be drawn from this graph -



(A) $a > 0$ (B) $b < 0$
(C) $c < 0$ (D) $b^2 - 4ac > 0$

5. If a, b, c are real distinct numbers satisfying the condition $a + b + c = 0$ then the roots of the quadratic equation $3ax^2 + 5bx + 7c = 0$ are -
(A) positive (B) negative (C) real and distinct (D) imaginary

6. The adjoining figure shows the graph of $y = ax^2 + bx + c$. Then -



(A) $a > 0$ (B) $b > 0$
(C) $c > 0$ (D) $b^2 < 4ac$

7. If $x^2 + Px + 1$ is a factor of the expression $ax^3 + bx + c$ then -
(A) $a^2 + c^2 = -ab$ (B) $a^2 - c^2 = -ab$ (C) $a^2 - c^2 = ab$ (D) none of these

8. The set of values of 'a' for which the inequality $(x - 3a)(x - a - 3) < 0$ is satisfied for all x in the interval $1 \le x \le 3$
(A) (1/3, 3) (B) (0, 1/3) (C) (–2, 0) (D) (–2, 3)

9. Let p(x) be the cubic polynomial $7x^3 - 4x^2 + K$. Suppose the three roots of p(x) form an arithmetic progression. Then the value of K, is -
(A) $\frac{4}{21}$ (B) $\frac{16}{147}$ (C) $\frac{16}{441}$ (D) $\frac{128}{1323}$

10. If the quadratic equation $ax^2 + bx + 6 = 0$ does not have two distinct real roots, then the least value of $2a + b$ is -
(A) 2 (B) – 3 (C) – 6 (D) 1

11. If p & q are distinct reals, then $2\{(x-p)(x-q) + (p-x)(p-q) + (q-x)(q-p)\} = (p-q)^2 + (x-p)^2 + (x-q)^2$ is satisfied by -
(A) no value of x (B) exactly one value of x (C) exactly two values of x (D) infinite values of x

12. The value of 'a' for which the expression $y = x^2 + 2a\sqrt{a^2-3}\,x + 4$ is perfect square, is -
(A) 4 (B) $\pm\sqrt{3}$
(C) ± 2 (D) $a \in (-\infty, -\sqrt{3}\,] \cup [\,\sqrt{3}, \infty)$

13. Set of values of 'K' for which roots of the quadratic $x^2 - (2K - 1)x + K(K - 1) = 0$ are -

(A) both less than 2 is $K \in (2, \infty)$ (B) of opposite sign is $K \in (-\infty, 0)\cup(1, \infty)$

(C) of same sign is $K \in (-\infty, 0)\cup(1, \infty)$ (D) both greater than 2 is $K \in (2, \infty)$

14. The correct statement is / are -

(A) If x_1 & x_2 are roots of the equation $2x^2 - 6x - b = 0$ $(b > 0)$, then $\frac{x_1}{x_2}+\frac{x_2}{x_1} < -2$

(B) Equation $ax^2 + bx + c = 0$ has real roots if $a < 0$, $c > 0$ and $b \in R$

(C) If $P(x) = ax^2 + bx + c$ and $Q(x) = -ax^2 + bx + c$, where $ac \neq 0$ and $a, b, c \in R$, then $P(x).Q(x)$ has at least two real roots.

(D) If both the roots of the equation $(3a + 1)x^2 - (2a + 3b)x + 3 = 0$ are infinite then $a = 0$ & $b \in R$

15. If $\alpha_1<\alpha_2<\alpha_3 < \alpha_4 < \alpha_5 < \alpha_6$, then the equation $(x - \alpha_1)(x-\alpha_3)(x-\alpha_5)+3(x - \alpha_2)(x - \alpha_4)(x - \alpha_6)=0$ has -

(A) three real roots (B) no real root in $(-\infty, \alpha_1)$

(C) one real root in (α_1, α_2) (D) no real root in (α_5, α_6)

16. Equation $2x^2 - 2(2a + 1)x + a(a + 1) = 0$ has one root less than 'a' and other root greater than 'a', if

(A) $0 < a < 1$ (B) $-1 < a < 0$ (C) $a > 0$ (D) $a < -1$

17. The value(s) of 'b' for which the equation, $2\log_{1/25}(bx + 28) = -\log_5(12 - 4x - x^2)$ has coincident roots, is/are -

(A) $b = -12$ (B) $b = 4$ (C) $b = 4$ or $b = -12$ (D) $b = -4$ or $b = 12$

18. For every $x \in R$, the polynomial $x^8 - x^5 + x^2 - x + 1$ is -

(A) positive (B) never positive

(C) positive as well as negative (D) negative

19. If α, β are the roots of the quadratic equation $(p^2 + p + 1)x^2 + (p - 1)x + p^2 = 0$ such that unity lies between the roots then the set of values of p is -

(A) ϕ (B) $p \in (-\infty, -1) \cup (0, \infty)$ (C) $p \in (-1, 0)$ (D) $(-1, 1)$

20. Three roots of the equation, $x^4 - px^3 + qx^2 - rx + s = 0$ are tanA, tanB & tanC where A, B, C are the angles of a triangle. The fourth root of the biquadratic is -

(A) $\frac{p-r}{1-q+s}$ (B) $\frac{p-r}{1+q-s}$ (C) $\frac{p+r}{1-q+s}$ (D) $\frac{p+r}{1+q-s}$

21. If $\log_{\left(\frac{x^2-12x+30}{10}\right)}\left(\log_2 \frac{2x}{5}\right) > 0$ then x belongs to interval -

(A) $(\frac{5}{2}, 6+\sqrt{6})$ (B) $(\frac{5}{2}, 6-\sqrt{6})$ (C) $(6, 6+\sqrt{6})$ (D) $(10, \infty)$

BRAIN TEASERS — ANSWER KEY — EXERCISE-2

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	C	C,D	B,C	A,B,C,D	C	B,C	C	B	D	B
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	D	C	C	A,B,C	A,B,C	A,C,D	B	A	C	A
Que.	21									
Ans.	B,D									

EXERCISE - 03

MISCELLANEOUS TYPE QUESTIONS

TRUE / FALSE

1. If a, b, c $\in$ Q, then roots of $ax^2 + 2(a + b)x - (3a + 2b) = 0$ are rational.
2. The necessary and sufficient condition for which a fixed number 'd' lies between the roots of quadratic equation $f(x) = ax^2 + bx + c = 0$; (a, b, c $\in$ R), is $f(d) < 0$.
3. If $0 < p < \pi$ then the quadratic equation, $(\cos p - 1)x^2 + x\cos p + \sin p = 0$ has real roots.
4. The necessary and sufficient condition for the quadratic function $f(x) = ax^2 + bx + c$, to take both positive and negative values is, $b^2 > 4ac$, where a, b, c $\in$ R & $a \neq 0$.

FILL IN THE BLANKS

1. If $a + b + c = 0$ & $a^2 + b^2 + c^2 = 1$ then the value of $a^4 + b^4 + c^4$ is ....
2. If $x^2 - 4x + 5 - \sin y = 0$, $y \in (0, 2\pi)$ then x = ... & y = ...
3. If α, β be the roots of the equation $ax^2 + bx + c = 0$ then the value of $\frac{a\alpha^2}{b\alpha + c} + \frac{a\beta^2}{b\beta + c}$ is equal to ....

MATCH THE COLUMN

Following question contains statements given in two columns, which have to be matched. The statements in **Column-I** are labelled as A, B, C and D while the statements in **Column-II** are labelled as p, q, r and s. Any given statement in **Column-I** can have correct matching with **ONE OR MORE** statement(s) in **Column-II**.

1. Consider the equation $x^2 + 2(a - 1)x + a + 5 = 0$, where 'a' is a parameter. Match of the real values of 'a' so that the given equation has

	Column-I		Column-II
(A)	imaginary roots	(p)	$\left(-\infty, -\frac{8}{7}\right)$
(B)	one root smaller than 3 and other root greater than 3	(q)	(–1, 4)
(C)	exactly one root in the interval (1, 3) & 1 and 3 are not the root of the equation	(r)	$\left(-\frac{4}{3}, -\frac{8}{7}\right)$
(D)	one root smaller than 1 and other root greater than 3	(s)	$\left(-\infty, -\frac{4}{3}\right)$

ASSERTION & REASON

These questions contains, Statement-I (assertion) and Statement-II (reason).

(A) Statement-I is true, Statement-II is true ; Statement-II is correct explanation for Statement-I.

(B) Statement-I is true, Statement-II is true ; Statement-II is NOT a correct explanation for statement-I

(C) Statement-I is true, Statement-II is false

(D) Statement-I is false, Statement-II is true

1. **Statement-I** : If equation $ax^2 + bx + c = 0$; (a, b, c $\in$ R) and $2x^2 + 3x + 4 = 0$ have a common root, then a : b : c = 2 : 3 : 4.

Because

Statement-II : If p + iq is one root of a quadratic equation with real coefficients then p – iq will be the other root ; p, q $\in$ R, $i = \sqrt{-1}$

(A) A (B) B (C) C (D) D

2. **Statement-I** : If f(x) is a quadratic expression such that f(1) + f(2) = 0. If –1 is a root of f(x) = 0 then the other root is $\frac{8}{5}$.

Because

Statement-II : If $f(x) = ax^2 + bx + c$ then sum of roots $= -\frac{b}{a}$ and product of roots $= \frac{c}{a}$

(A) A (B) B (C) C (D) D

3. **Statement-I** : If a + b + c > 0 and a < 0 < b < c, then the roots of the equation $a(x - b)(x - c) + b(x - c)(x - a) + c(x - a)(x - b) = 0$ are of both negative.

Because

Statement-II : If both roots are negative, then sum of roots < 0 and product of roots > 0

(A) A (B) B (C) C (D) D

4. **Statement-I** : Let $(a_1, a_2, a_3, a_4, a_5)$ denote a re-arrangement of (1, –4, 6, 7, –10). Then the equation $a_1x^4 + a_2x^3 + a_3x^2 + a_4x + a_5 = 0$ has at least two real roots.

Because

Statement-II : If $ax^2 + bx + c = 0$ and a + b + c = 0, (i.e. in a polynomial the sum of coefficients is zero) then x = 1 is root of $ax^2 + bx + c = 0$.

(A) A (B) B (C) C (D) D

5. **Statement-I** : If roots of the equation $x^2 - bx + c = 0$ are two consecutive integers, then $b^2 - 4c = 1$.

Because

Statement-II : If a, b, c are odd integer then the roots of the equation $4abc\,x^2 + (b^2 - 4ac)x - b = 0$ are real and distinct.

(A) A (B) B (C) C (D) D

COMPREHENSION BASED QUESTIONS

Comprehension # 1

If α, β, γ be the roots of the equation $ax^3 + bx^2 + cx + d = 0$. To obtain the equation whose roots are f(α), f(β), f(γ), where f is a function, we put y = f(α) and simplify it to obtain α = g(y) (some function of y). Now, α is a root of the equation $ax^3 + bx^2 + cx + d = 0$, then we obtain the desired equation which is $a\{g(y)\}^3 + b\{g(y)\}^2 + c\{g(y)\} + d = 0$

For example, if α, β, γ are the roots of $ax^3 + bx^2 + cx + d = 0$. To find equation whose roots are $\frac{1}{\alpha}, \frac{1}{\beta}, \frac{1}{\gamma}$ we put $y = \frac{1}{\alpha} \Rightarrow \alpha = \frac{1}{y}$

As α is a root of $ax^3 + bx^2 + cx + d = 0$

we get $\frac{a}{y^3} + \frac{b}{y^2} + \frac{c}{y} + d = 0 \Rightarrow dy^3 + cy^2 + by + a = 0$

This is desired equation.

On the basis of above information, answer the following questions :

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

(A) $\frac{2\alpha+1}{\alpha-1}, \frac{2\beta+1}{\beta-1}$ (B) $\frac{2\alpha-1}{\alpha+1}, \frac{2\beta-1}{\beta+1}$ (C) $\frac{\alpha+1}{\alpha-2}, \frac{\beta+1}{\beta-2}$ (D) $\frac{2\alpha+3}{\alpha-1}, \frac{2\beta+3}{\beta-1}$

2. If α, β are the roots of the equation $2x^2 + 4x - 5 = 0$, the equation whose roots are the reciprocals of 2α – 3 and 2β – 3 is -

(A) $x^2 + 10x - 11 = 0$ (B) $11x^2 + 10x + 1 = 0$

(C) $x^2 + 10x + 11 = 0$ (D) $11x^2 - 10x + 1 = 0$

3. If α, β are the roots of the equation $px^2 - qx + r = 0$, then the equation whose roots are $\alpha^2 + \frac{r}{p}$ and $\beta^2 + \frac{r}{p}$ is-

(A) $p^3x^2 + pq^2x + r = 0$
(B) $px^2 - qx + r = 0$
(C) $p^3x^2 - pq^2x + q^2r = 0$
(D) $px^2 + qx - r = 0$

4. If α, β, γ are the roots of the equation $x^3 - x - 1 = 0$, then the value of $\Pi\left(\frac{1+\alpha}{1-\alpha}\right)$ is equal to -

(A) -7 (B) -5 (C) -3 (D) -1

Comprehension # 2

Let $(a + \sqrt{b})^{Q(x)} + (a - \sqrt{b})^{Q(x) - 2\lambda} = A$, where $\lambda \in N$, $A \in R$ and $a^2 - b = 1$

$\therefore$ $(a + \sqrt{b})(a - \sqrt{b}) = 1 \Rightarrow (a + \sqrt{b}) = (a - \sqrt{b})^{-1}$ and $(a - \sqrt{b}) = (a + \sqrt{b})^{-1}$

ie, $(a \pm \sqrt{b}) = \left(a+\sqrt{b}\right)^{\pm 1}$ or $\left(a-\sqrt{b}\right)^{\mp 1}$

By substituting $(a+\sqrt{b})^{Q(x)}$ as t in the equation we get a quadratic in t.

Also $a + ar + ar^2 .... \infty = \frac{a}{1-r}$ where $-1 < r < 1$

On the basis of above information, answer the following questions :

1. Solution of $(2+\sqrt{3})^{x^2-2x+1} + (2-\sqrt{3})^{x^2-2x-1} = \frac{4}{2-\sqrt{3}}$ are-

(A) $1 \pm \sqrt{3}$, 1 (B) $1 \pm \sqrt{2}$, 1 (C) $1 \pm \sqrt{3}$, 2 (D) $1 \pm \sqrt{2}$, 2

2. The number of real solutions of the equation $(15 + 4\sqrt{14})^t + (15 - 4\sqrt{14})^t = 30$ are - where $t = x^2 - 2|x|$

(A)0 (B) 2 (C) 4 (D) 6

3. If $\left(\sqrt{(49+20\sqrt{6})}\right)^{\sqrt{a\sqrt{a\sqrt{a.....\infty}}}} + (5-2\sqrt{6})^{x^2+x-3-\sqrt{x\sqrt{x\sqrt{x....\infty}}}} = 10$ where $a = x^2 - 3$, then x is -

(A) $-\sqrt{2}$ (B) $\sqrt{2}$ (C) -2 (D) 2

MISCELLANEOUS TYPE QUESTION — **ANSWER KEY** — EXERCISE -3

- ***True / False***
  1. T 2. F 3. T 4. T
- ***Fill in the Blanks***
  1. 1/2 2. $x = 2$ & $y = \pi/2$ 3. -2
- ***Match the Column***
  1. (A) $\to$ (q), (B) $\to$ (p, r, s), (C) $\to$ (r), (D) $\to$ (s)
- ***Assertion & Reason***
  1. A 2. A 3. D 4. A 5. B
- ***Comprehension Based Questions***
  Comprehension # 1 : 1. C 2. B 3. C 4. D
  Comprehension # 2 : 1. B 2. C 3. D

EXERCISE - 04 [A]

CONCEPTUAL SUBJECTIVE EXERCISE

1. If α, β are the roots of the equation $x^2 - 2x + 3 = 0$ obtain the equation whose roots are $\alpha^3 - 3\alpha^2 + 5\alpha - 2$, $\beta^3 - \beta^2 + \beta + 5$.
2. If one root of the equation $ax^2 + bx + c = 0$ be the square of the other, prove that $b^3 + a^2c + ac^2 = 3abc$.
3. Show that if p, q , r & s are real numbers & $pr = 2(q + s)$, then at least one of the equations $x^2 + px + q = 0$, $x^2 + rx + s = 0$ has real roots.
4. Let a, b, c, d be distinct real numbers and a and b are the roots of quadratic equation $x^2 - 2cx - 5d = 0$. If c and d are the roots of the quadratic equation $x^2 - 2ax - 5b = 0$ then find the numerical values of $a + b + c + d$.
5. Find the product of the real roots of the equation, $x^2 + 18x + 30 = 2\sqrt{x^2+18x+45}$
6. Find the range of values of a, such that $f(x) = \dfrac{ax^2 + 2(a+1)x + 9a + 4}{x^2 - 8x + 32}$ is always negative.
7. Find the values of 'a' for which $-3 < \dfrac{x^2 + ax - 2}{x^2 + x + 1} < 2$ is valid for all real x .
8. If the quadratic equations $x^2 + bx + ca = 0$ & $x^2 + cx + ab = 0$ have a common root, prove that the equation containing their other roots is $x^2 + ax + bc = 0$.
9. The equation $x^2 - ax + b = 0$ & $x^3 - px^2 + qx = 0$, where $b \neq 0$, $q \neq 0$, have one common root & the second equation has two equal roots. Prove that $2(q + b) = ap$.

Find the solutions of following inequations : (10 to 14)

10. $\dfrac{(x-2)(x-4)(x-7)}{(x+2)(x+4)(x+7)} > 1$
11. $(x^2 - x - 1)(x^2 - x - 7) < -5.$
12. $(x^2 - 2x)(2x - 2) - 9\dfrac{2x-2}{x^2-2x} \le 0$
13. $\dfrac{1}{x-2} + \dfrac{1}{x-1} > \dfrac{1}{x}$
14. $\dfrac{20}{(x-3)(x-4)} + \dfrac{10}{x-4} + 1 > 0$

Find the solutions of following miscellaneous inequations : (15 to 20)

15. $|x^2 - 2x - 3| < |x^2 - x + 5|$
16. $x - 3 < \sqrt{x^2 + 4x - 5}$
17. $\log_{\frac{5}{8}}\left(2x^2 - x - \dfrac{3}{8}\right) \ge 1$
18. $\left(\dfrac{3}{4}\right)^{6x+10-x^2} < \dfrac{27}{64}$
19. $\log_{1/2}(x + 1) > \log_2(2 - x).$
20. $\log_x 2 \, . \, \log_{2x} 2 \, . \, \log_2 4x > 1.$
21. Find all values of a for which the inequality $(a + 4)x^2 - 2ax + 2a - 6 < 0$ is satisfied for all $x \in R$.
22. Find all values of a for which both roots of the equation $x^2 - 6ax + 2 - 2a + 9a^2 = 0$ are greater than 3.

23. Find all the values of the parameter 'a' for which both roots of the quadratic equation $x^2 - ax + 2 = 0$ belong to the interval (0, 3).

24. Find the values of K so that the quadratic equation $x^2 + 2(K - 1)x + K + 5 = 0$ has atleast one positive root.

25. If $a < b < c < d$ then prove that the roots of the equation ; $(x - a)(x - c) + 2(x - b)(x - d) = 0$ are real & distinct.

26. Two roots of a biquadratic $x^4 - 18x^3 + kx^2 + 200x - 1984 = 0$ have their product equal to (–32). Find the value of k.

CONCEPTUAL SUBJECTIVE EXERCISE **ANSWER KEY** EXERCISE-4(A)

1. $x^2 - 3x + 2 = 0$ **4.** 30 **5.** 20 **6.** $a \in \left(-\infty, -\frac{1}{2}\right)$

7. $-2 < a < 1$ **10.** $(-\infty, -7) \cup (-4, -2)$ **11.** $(-2, -1) \cup (2, 3)$ **12.** $(-\infty, -1] \cup (0, 1] \cup (2, 3]$

13. $\left(-\sqrt{2}, 0\right) \cup \left(1, \sqrt{2}\right) \cup (2, +\infty)$ **14.** $(-\infty, -2) \cup (-1, 3) \cup (4, +\infty)$ **15.** $(-8, \infty)$

16. $(-\infty, -5] \cup [1, \infty)$ **17.** $\left[-\frac{1}{2}, -\frac{1}{4}\right) \cup \left(\frac{3}{4}, 1\right]$ **18.** 7

19. $-1 < x < \frac{1-\sqrt{5}}{2}$ or $\frac{1+\sqrt{5}}{2} < x < 2$ **20.** $2^{-\sqrt{2}} < x < 2^{-1}$; $1 < x < 2^{\sqrt{2}}$

21. For all $a \in (-\infty, -6)$ **22.** For all $a \in (11/9, +\infty)$ **23.** $2\sqrt{2} \le a < \frac{11}{3}$

24. $K \le -1$ **26.** $k = 86$

EXERCISE - 04 [B]

BRAIN STORMING SUBJECTIVE EXERCISE

1. If one root of the quadratic equation $ax^2 + bx + c = 0$ is equal to the n^{th} power of the other, then show that $(ac^n)^{1/(n+1)} + (a^nc)^{1/(n+1)} + b = 0$.

2. Let $P(x) = x^2 + bx + c$, where b and c are integer. If P(x) is a factor of both $x^4 + 6x^2 + 25$ and $3x^4 + 4x^2 + 28x + 5$, find the value of P(1).

3. Find the true set of values of p for which the equation : $p.2^{\cos^2 x} + p.2^{-\cos^2 x} - 2 = 0$ has real roots.

4. If the coefficients of the quadratic equation $ax^2 + bx + c = 0$ are odd integers then prove that the roots of the equation cannot be rational number.

5. If the three equations $x^2 + ax + 12 = 0$, $x^2 + bx + 15 = 0$ and $x^2 + (a + b)x + 36 = 0$ have a common positive root, find a and b and the roots of the equations.

6. If the quadratic equation $ax^2 + bx + c = 0$ has real roots, of opposite sign in the interval $(-2,2)$ then prove that

$$1 + \frac{c}{4a} - \left|\frac{b}{2a}\right| > 0 .$$

7. Show that the function $z = 2x^2 + 2xy + y^2 - 2x + 2y + 2$ is not smaller than -3.

8. For $a \le 0$, determine all real roots of the equation $x^2 - 2a\,|x - a| - 3a^2 = 0$.

9. The equation $x^n + px^2 + qx + r = 0$, where $n \ge 5$ & $r \ne 0$ has roots $\alpha_1, \alpha_2, \alpha_3 \ldots\ldots\ldots \alpha_n$.

   Denoting $\sum_{i=1}^{n} \alpha_i^k$ by S_k.

   (a) Calculate S_2 & deduce that the roots cannot all be real.

   (b) Prove that $S_n + pS_2 + qS_1 + nr = 0$ & hence find the value of S_n.

10. Find the values of 'b' for which the equation $2\log_{\frac{1}{25}}(bx + 28) = -\log_5(12 - 4x - x^2)$ has only one solution.

11. Solve the inequality : $\log_3 \frac{|x^2 - 4x| + 3}{x^2 + |x - 5|} \ge 0$

BRAIN STORMING SUBJECTIVE EXERCISE	ANSWER KEY	EXERCISE-4(B)

2. P(1) = 4 3. [4/5, 1] 5. a = − 7, b = − 8 ; (3, 4) ; (3 , 5) and (3 , 12)

8. $x = (1 - \sqrt{2})a$ or $(\sqrt{6} - 1)a$ 9. (a) $S_2 = 0$, (b) $S_n = -nr$ 10. $(-\infty, -14) \cup \{4\} \cup \left[\frac{14}{3}, \infty\right)$

11. $x \le \frac{-2}{3}$, $\frac{1}{2} \le x \le 2$

EXERCISE - 05 [A]

JEE-[MAIN] : PREVIOUS YEAR QUESTIONS

1. If the roots of the equation $x^2 - 5x + 16 = 0$ are α, β and the roots of the equation $x^2 + px + q = 0$ are $(\alpha^2 + \beta^2)$ and $\frac{\alpha\beta}{2}$, then- [AIEEE-2002]

(1) p = 1 and q = 56 (2) p = 1 and q = –56
(3) p = –1 and q = 56 (4) p = –1 and q = –56

2. If α and β be the roots of the equation $(x - a)(x - b) = c$ and $c \neq 0$, then roots of the equation $(x - \alpha)(x - \beta) + c = 0$ are - [AIEEE-2002]

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

3. If $\alpha^2 = 5\alpha - 3$, $\beta^2 = 5\beta - 3$ then the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ (where $\alpha \neq \beta$) is- [AIEEE-2002]

(1) 19/3 (2) 25/3 (3) –19/3 (4) none of these

4. The value of a for which one roots of the quadratic equation $(a^2 - 5a + 3)x^2 + (3a - 1)x + 2 = 0$ is twice as large as the other is [AIEEE-2003]

(1) – 2/3 (2) 1/3 (3) – 1/3 (4) 2/3

5, If the sum of the roots of the quadratic equation $ax^2 + bx + c = 0$ is equal to the sum of the square of their reciprocals, then $\frac{a}{c}, \frac{b}{a}$ and $\frac{c}{b}$ are in [AIEEE-2003]

(1) geometric progression (2) harmonic progression
(3) arithmetic-geometric progression (4) arithmetic progression

6. The number of real solutions of the equation $x^2 - 3|x| + 2 = 0$, is- [AIEEE-2003]

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

7. The real number x when added to its inverse gives the minimum value of the sum at x equal to- [AIEEE-2003]

(1) 1 (2) –1 (3) –2 (4) 2

8. Let two numbers have arithmetic mean 9 and geometric mean 4. Then these numbers are the roots of the quadratic equation- [AIEEE-2004]

(1) $x^2 + 18x - 16 = 0$ (2) $x^2 - 18x + 16 = 0$
(3) $x^2 + 18x + 16 = 0$ (4) $x^2 - 18x - 16 = 0$

9. If $(1 - p)$ is a root of quadratic equation $x^2 + px + (1 - p) = 0$ then its roots are- [AIEEE-2004]

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

10. If one root of the 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- [AIEEE-2004]

(1) 3 (2) 12 (3) 49/4 (4) 4

11. If 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- [AIEEE-2005]

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

12. If the roots of the equation $x^2 - bx + c = 0$ be two consecutive integers, then $b^2 - 4c$ equals- [AIEEE-2005]

(1) 1 (2) 2 (3) 3 (4) –2

13. 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- [AIEEE-2005]

(1) [4, 5] (2) $(-\infty, 4)$ (3) $(6, \infty)$ (4) (5, 6)

14. If the equation $a_n x^n + a_{n-1} x^{n-1} + \ldots + a_1 x = 0$, $a_1 \neq 0$, $n \geq 2$, has a positive root $x = \alpha$, then the equation $na_n x^{n-1} + (n - 1) a_{n-1} x^{n-2} + \ldots + a_1 = 0$ has a positive root, which is- [AIEEE-2005]

(1) equal to α (2) greater than or equal to α
(3) smaller than α (4) greater than α

15. All the values of m for which both roots of the equation $x^2 - 2mx + m^2 - 1 = 0$ are greater than –2 but less than 4, lie in the interval- **[AIEEE-2006]**

(1) $-1 < m < 3$ (2) $1 < m < 4$ (3) $-2 < m < 0$ (4) $m > 3$

16. If the roots of the quadratic equation $x^2 + px + q = 0$ are tan 30 and tan 15 , respectively then the value of $2 + q - p$ is- **[AIEEE-2006]**

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

17. If x is real, then maximum value of $\frac{3x^2+9x+17}{3x^2+9x+7}$ is- **[AIEEE-2006]**

(1) 1 (2) $\frac{17}{7}$ (3) $\frac{1}{4}$ (4) 41

18. If the difference between the roots of the equation $x^2 + ax + 1 = 0$ is less than $\sqrt{5}$, then the set of possible values of a is **[AIEEE-2007]**

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

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

19. The quadratic equations $x^2 - 6x + a = 0$ and $x^2 - cx + 6 = 0$ have one root in common. The other roots of the first and second equations are integers in the ratio 4:3. Then the common root is **[AIEEE-2008]**

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

20. If the roots of the equation $bx^2 + cx + a = 0$ be imaginary, then for all real values of x, the expression $3b^2x^2 + 6bcx + 2c^2$ is :- **[AIEEE-2009]**

(1) Greater than –4ab (2) Less than –4ab

(3) Greater than 4ab (4) Less than 4ab

21. If α and β are the roots of the equation $x^2 - x + 1 = 0$, then $\alpha^{2009} + \beta^{2009} =$ **[AIEEE-2010]**

(1) –2 (2) –1 (3) 1 (4) 2

22. Let for $a \neq a_1 \neq 0$, $f(x) = ax^2 + bx + c$, $g(x) = a_1x^2 + b_1x + c_1$ and $p(x)=f(x) - g(x)$. If $p(x) = 0$ only for $x = -1$ and $p(-2) = 2$, then the value of $p(2)$ is: **[AIEEE-2011]**

(1) 18 (2) 3 (3) 9 (4) 6

23. Sachin and Rahul attempted to solve a quadratic equation. Sachin made a mistake in writing down the constant term and ended up in roots (4, 3). Rahul made a mistake in writing down coefficient of x to get roots (3, 2). The correct roots of equation are: **[AIEEE-2011]**

(1) –4, –3 (2) 6, 1 (3) 4, 3 (4) –6, –1

24. The equation $e^{\sin x} - e^{-\sin x} - 4 = 0$ has : **[AIEEE-2012]**

(1) exactly four real roots. (2) infinite number of real roots.

(3) no real roots. (4) exactly one real root.

PREVIOUS YEARS QUESTIONS **ANSWER KEY** EXERCISE-5 [A]

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	4	3	1	4	2	1	1	2	1	3
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	4	1	2	3	1	4	4	4	4	1
Que.	21	22	23	24						
Ans.	3	1	2	3						

EXERCISE - 05 [B] JEE-[ADVANCED] : PREVIOUS YEAR QUESTIONS

1. Let a, b, c be real numbers with $a \neq 0$ and let α, β be the roots of the equation $ax^2 + bx + c = 0$. Express the roots of $a^3x^2 + abcx + c^3 = 0$ in terms of α, β.

[JEE 2001, Mains, 5 out of 100]

2. 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) $(\sqrt{2}, \infty)$ [JEE 2002 (screening), 3]

3. If $x^2 + (a - b)x + (1 - a - b) = 0$ where $a, b \in R$ then find the values of 'a' for which equation has unequal real roots for all values of 'b'. [JEE 2003, Mains-4 out of 60]

4. (a) If one root of the equation $x^2 + px + q = 0$ is the square of the other, then

(A) $p^3 + q^2 - q(3p + 1) = 0$ (B) $p^3 + q^2 + q(1 + 3p) = 0$

(C) $p^3 + q^2 + q(3p - 1) = 0$ (D) $p^3 + q^2 + q(1 - 3p) = 0$

(b) If $x^2 + 2ax + 10 - 3a > 0$ for all $x \in R$, then

(A) $-5 < a < 2$ (B) $a < -5$ (C) $a > 5$ (D) $2 < a < 5$

[JEE 2004 (Screening)]

5. Find the range of values of t for which $2 \sin t = \dfrac{1-2x+5x^2}{3x^2-2x-1}$, $t \in \left[-\dfrac{\pi}{2}, \dfrac{\pi}{2}\right]$.

[JEE 2005(Mains), 2]

6. (a) Let a, b, c be the sides of a triangle. No two of them are equal and $\lambda \in R$. If the roots of the equation $x^2 + 2(a + b + c)x + 3\lambda(ab + bc + ca) = 0$ are real, then

(A) $\lambda < \dfrac{4}{3}$ (B) $\lambda > \dfrac{5}{3}$ (C) $\lambda \in \left(\dfrac{1}{3}, \dfrac{5}{3}\right)$ (D) $\lambda \in \left(\dfrac{4}{3}, \dfrac{5}{3}\right)$

[JEE 2006, 3]

(b) If roots of the equation $x^2 - 10cx - 11d = 0$ are a, b and those of $x^2 - 10ax - 11b = 0$ are c, d, then find the value of $a + b + c + d$. (a, b, c and d are distinct numbers) [JEE 2006, 6]

7. (a) Let α, β be the roots of the equation $x^2 - px + r = 0$ and $\alpha/2$, 2β be the roots of the equation $x^2 - qx + r = 0$. Then the value of 'r' is

(A) $\dfrac{2}{9}(p-q)(2q - p)$ (B) $\dfrac{2}{9}(q - p)(2p - q)$

(C) $\dfrac{2}{9}(q - 2p)(2q - p)$ (D) $\dfrac{2}{9}(2p-q)(2q - p)$

MATCH THE COLUMN :

(b) Let $f(x) = \dfrac{x^2-6x+5}{x^2-5x+6}$

Match the expressions / statements in **Column I** with expressions / statements in **Column II**.

Column I	Column II
(A) If $-1 < x < 1$, then $f(x)$ satisfies	(P) $0 < f(x) < 1$
(B) If $1 < x < 2$, the $f(x)$ satisfies	(Q) $f(x) < 0$
(C) If $3 < x < 5$, then $f(x)$ satisfies	(R) $f(x) > 0$
(D) If $x > 5$, then $f(x)$ satisfies	(S) $f(x) < 1$

[JEE 2007, 3+6]

ASSERTION & REASON :

8. Let a, b, c, p, q be real numbers. Suppose α, β are the roots of the equation $x^2 + 2px + q = 0$ and α, $1/\beta$ are the roots of the equation $ax^2 + 2bx + c = 0$, where $\beta^2 \notin \{-1, 0, 1\}$

STATEMENT-1 : $(p^2 - q)(b^2 - ac) \geq 0$

and

STATEMENT-2 : $b \neq pa$ or $c \neq qa$

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is **NOT** a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True [JEE 2008, 3 (–1)]

9. The smallest value of k, for which both the roots of the equation, $x^2 - 8kx + 16(k^2 - k + 1) = 0$ are real, distinct and have values at least 4, is [JEE 2009, 4 (–1)]

10. Let p and q be real numbers such that $p \neq 0$, $p^3 \neq q$ and $p^3 \neq -q$. If α and β are nonzero complex numbers satisfying $\alpha + \beta = -p$ and $\alpha^3 + \beta^3 = q$, then a quadratic equation having $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ as its roots is [JEE 2010, 3]

(A) $(p^3 + q)x^2 - (p^3 + 2q)x + (p^3 + q) = 0$ (B) $(p^3 + q)x^2 - (p^3 - 2q)x + (p^3 + q) = 0$

(C) $(p^3 - q)x^2 - (5p^3 - 2q)x + (p^3 - q) = 0$ (D) $(p^3 - q)x^2 - (5p^3 + 2q)x + (p^3 - q) = 0$

11. Let α and β be the roots of $x^2 - 6x - 2 = 0$, with $\alpha > \beta$. If $a_n = \alpha^n - \beta^n$ for $n \geq 1$, then the value of $\frac{a_{10} - 2a_8}{2a_9}$ is [JEE 2011]

(A) 1 (B) 2 (C) 3 (D) 4

12. A value of b for which the equations

$$x^2 + bx - 1 = 0$$
$$x^2 + x + b = 0,$$

have one root in common is - [JEE 2011]

(A) $-\sqrt{2}$ (B) $-i\sqrt{3}$ (C) $i\sqrt{5}$ (D) $\sqrt{2}$

PREVIOUS YEARS QUESTIONS **ANSWER KEY** EXERCISE-5 [B]

1. $\gamma = \alpha^2\beta$ and $\delta = \alpha\beta^2$ or $\gamma = \alpha\beta^2$ and $\delta = \alpha^2\beta$ 2. B 3. $a > 1$

4. (a) D ; (b) A 5. $\left[-\frac{\pi}{2}, -\frac{\pi}{10}\right] \cup \left[\frac{3\pi}{10}, \frac{\pi}{2}\right]$ 6. (a) A; (b) 1210

7. (a) D; (b) (A) P, R, S; (B) Q, S; (C) Q, S; (D) P, R, S 8. B 9. 2

10. B 11. C 12. B