(Questions asked in previous AIEEE & IITJEE)

SECTION - A

Q.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]**

(A) p = 1 and q = 56 (B) p = 1 and q = – 56
(C) p = – 1 and q = 56 (D) p = – 1 and q = – 56

Q.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]**

(A) a and c (B) b and c
(C) a and b (D) a+ b and b + c

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

(A) 19/3 (B) 25/3
(C) – 19/3 (D) None of these

Q.4 If the sum of the roots of the quadratic equation $ax^2 + bx + c = 0$ is equal to the sum of the squares of their reciprocals, then $\frac{a}{c}, \frac{b}{a}$ and $\frac{c}{b}$ are in- **[AIEEE-2003]**

(A) Arithmetic Geometric Progression
(B) Arithmetic Progression
(C) Geometric Progression
(D) Harmonic Progression

Q.5 The value of 'a' for which one root 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]**

(A) $-\frac{1}{3}$ (B) $\frac{2}{3}$
(C) $-\frac{2}{3}$ (D) $\frac{1}{3}$

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

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

Q.7 If (1– p) is a root of quadratic equation $x^2 + px + (1 - p) = 0$ then its roots are- **[AIEEE-2004]**

(A) 0,1 (B) – 1, 1
(C) 0, – 1 (D) – 1, 2

Q.8 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]**

(A) 49/4 (B) 12 (C) 3 (D) 4

Q.9 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 - **[AIEEE-2005]**

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

Q.10 If the roots of the equation $x^2 - bx + c = 0$ be two consecutive integers, then $b^2 - 4c$ equals - **[AIEEE-2005]**

(A) –2 (B) 3 (C) 2 (D) 1

Q.11 In a triangle PQR, $\angle R = \frac{\pi}{2}$, If $\tan\left(\frac{P}{2}\right)$ and $\tan\left(\frac{Q}{2}\right)$ are the roots of $ax^2 + bx + c = 0, a \neq 0$ then - **[AIEEE-2005]**

(A) a = b + c (B) c = a + b
(C) b = c (D) b = a + c

Q.12 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]**

(A) (5, 6] (B) $(6, \infty)$
(C) $(-\infty, 4)$ (D) [4, 5]

Q.13 If the roots of the quadratic equation $x^2 + px + q = 0$ are tan 30º and tan15º, respectively then the value of 2 + q – p is – **[AIEEE-2006]**

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

Q.14 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]**

(A) m > 3 (B) – 1 < m < 3
(C) 1 < m < 4 (D) – 2 < m < 0

Q.15 If x is real, the maximum value of $\frac{3x^2 + 9x + 17}{3x^2 + 9x + 7}$ is – **[AIEEE-2006]**

(A) 41 (B) 1
(C) $\frac{17}{7}$ (D) $\frac{1}{4}$

Q.16 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]**

(A) (–3, 3) (B) (–3, ∞)
(C) (3, ∞) (D) (– ∞, – 3)

Q.17 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]**

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

Q.18 How many real solution does the equation $x^7 + 14x^5 + 16x^3 + 30x - 560 = 0$ have ? **[AIEEE-2008]**

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

Q.19 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]**

(A) Greater than 4 ab (B) Less than 4ab
(C) Greater than – 4ab (D) Less than – 4ab

SECTION - B

Q.1 If $e^{\{(\sin^2 x+\sin^4 x+\sin^6 x.....\infty)\ \ell n\ 2\}}$ satisfies the equation $x^2 - 9x + 8 = 0$, find the value of $\frac{\cos x}{\cos x + \sin x}$, $0 < x < \frac{\pi}{2}$ **[IIT-91]**

(A) $\frac{1}{1+\sqrt{3}}$ (B) $\frac{1}{1-\sqrt{3}}$

(C) $\frac{2}{1-\sqrt{2}}$ (D) None of these

Q.2 If the roots of the equation $(x - a)(x - b) - k = 0$ be c & d then find the equation whose roots are a & b. **[IIT-92]**

(A) $(x - c)(x - d) + k = 0$
(B) $(x + c)(x - a) + k = 0$
(C) $(x - c) + (x - a) = 0$
(D) None of these

Q.3 The set of values of p for which the roots of the equation $3x^2 + 2x + p(p-1) = 0$ are of opposite sign is- **[IIT-92]**

(A) (–∞,0) (B) (0,1)
(C) (1,∞) (D) (0,∞)

Q.4 Let $p,q \in \{1,2,3,4\}$. The number of equations of the form $px^2 + qx + 1 = 0$ having real roots is- **[IIT Sc. -94]**

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

Q.5 Let α and β be the roots of the equation $x^2 + x + 1 = 0$. The equation whose roots are α^{19}, β^7 is **[IIT-94]**

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

Q.6 If p,q are roots of the equation $x^2 + px + q = 0$, then- **[IIT Sc.-95]**

(A) p = 1 (B) p = – 2
(C) p = 1 or 0 (D) p = – 2 or 0

Q.7 Let p and q are roots of the equation $x^2 - 2x + A = 0$ and r,s are roots of $x^2 - 18x + B = 0$ if $p < q < r < s$ are in A.P. then the value of A and B are - **[IIT-97]**

(A) – 7, – 33 (B) – 7, – 37
(C) – 3, 77 (D) None of these

Q.8 The equation $\sqrt{(x+1)} - \sqrt{(x-1)} = \sqrt{(4x-1)}$ has- **[IIT-97 can.]**

(A) No Solution (B) One solution
(C) Two solutions
(D) More than 2 solutions

Q.9 The sum of all real roots of the equation $|x-2|^2 + |x-2| - 2 = 0$ is **[IIT-97]**

(A) 2 (B) 4
(C) 1 (D) none of these

Q.10 The number of values of x in the interval $[0, 5\pi]$ satisfying the equation $3\sin^2 x - 7\sin x + 2 = 0$ is - **[IIT-98]**

(A) 0 (B) 5 (C) 6 (D) 10

Q.11 If the roots of the equation $x^2 - 2ax + a^2 + a - 3 = 0$ are real and less than 3, then - **[IIT-99]**

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

Q.12 The harmonic mean of the roots of the equation $(5+\sqrt{2})x^2 - (4+\sqrt{5})x + 8 + 2\sqrt{5} = 0$ is- **[IIT-99]**

(A) 2 (B) 4 (C) 6 (D) 8

Q.13 In a ΔPQR, $\angle R = \frac{\pi}{2}$. If $\tan\frac{P}{2}$ and $\tan\frac{Q}{2}$ are the roots of the equation $ax^2 + bx + c = 0$ $(a \neq 0)$, then- **[IIT-99]**

(A) a + b = c (B) b + c = a
(C) c + a = b (D) b = c

Q.14 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 - **[IIT Sc.-2000]**

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

Q.15 If α and β $(\alpha < \beta)$, are the roots of the equation $x^2 + bx + c = 0$, where $c < 0 < b$, then **[IITSc. - 2000]**

(A) $0 < \alpha < \beta$ (B) $\alpha < 0 < \beta < |\alpha|$
(C) $\alpha < \beta < 0$ (D) $\alpha < 0 < |\alpha| < \beta$

Q.16 If b > a, then the equation (x – a) (x – b) – 1 = 0, has - **[IIT Sc.-2000]**

(A) both roots in [a, b]
(B) both roots in $(-\infty, a)$
(C) both roots in $(b, +\infty)$
(D) one root in $(-\infty, a)$ and other in $(b, +\infty)$

Q.17 Let α,β be the roots of $x^2 - x + p = 0$ and γ,δ be the roots of $x^2 - 4x + q = 0$. If $\alpha,\beta,\gamma,\delta$ are in G.P., then the integral values of p and q respectively, are- **[IIT Sc.-2001]**

(A) –2, – 32 (B) – 2, 3
(C) – 6, 3 (D) – 6, – 32

Q.18 The set of all real numbers x for which $x^2 - |x + 2| + x > 0$, is- **[IIT Sc.-2002]**

(A) $(-\infty, -2) \cup (2, \infty)$
(B) $(-\infty, -\sqrt{2}) \cup (\sqrt{2}, \infty)$
(C) $(-\infty, -1) \cup (1, \infty)$
(D) $(\sqrt{2}, \infty)$

Q.19 If one root of the equation $x^2 + px + q = 0$ is square of the other then for any p & q, it will satisfy the relation- **[IIT Sc.-2004]**

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

Q.20 Let $x^2 + 2ax + 10 - 3a > 0$ for every real value of x, then- **[IIT Sc.-2004]**

(A) a > 5 (B) a < – 5
(C) –5 < a < 2 (D) 2 < a < 5

Q.21 α , β are roots of equation $ax^2 + bx + c = 0$ and $\alpha + \beta$, $\alpha^2 + \beta^2, \alpha^3 + \beta^3$ are in G.P., $\Delta = b^2 - 4ac$, then **[IIT Sc.-2005]**

(A) $\Delta b = 0$ (B) $bc \neq 0$
(C) $\Delta \neq 0$ (D) $\Delta = 0$

Q.22 Let a, b, c be sides of a triangle and any two of them are not 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 **[IIT - 2006]**

(A) $\frac{4}{3} < \lambda < \frac{5}{3}$ (B) $\frac{1}{3} < \lambda < \frac{5}{3}$
(C) $\lambda > \frac{5}{3}$ (D) $\lambda < \frac{4}{3}$

Q.23 If roots of $x^2 - 10cx - 11d = 0$ are a, b and the roots of $x^2 - 10ax - 11b = 0$ are c, d, then the value of a+b+c+d is equal to (a,b,c,d are different numbers) …… **[IIT -2006]**

Q.24 Let α,β be the roots of the equation $x^2 - px + r = 0$ and $\frac{\alpha}{2}$, 2β be the roots of the equation $x^2 - qx + r = 0$. Then the value of r is **[IIT -2007]**

(A) $\frac{2}{9}(p - q)(2q - p)$
(B) $\frac{2}{9}(q - p)(2p - q)$
(C) $\frac{2}{9}(q - 2p)(2q - p)$
(D) $\frac{2}{9}(2p - q)(2q - p)$

Q.25 Let $f(x) = \frac{x^2 - 6x + 5}{x^2 - 5x + 6}$

Match the expressions/statements in Column I with expression/statements in Column II and indicate your answer by darkening the appropriate bubbles in the 4×4 matrix given in the ORS. **[IIT -2007]**

Column I	Column II
(A) If –1 < x < 1, then f(x) satisfies	(P) 0 < f(x) < 1
(B) If 1 < x < 2, then 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

ANSWER KEY

PAST YEAR

SECTION-A

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	A	A	B	C	D	C	C	A	B	C	A	B	A	C	B	D	A	B	A	C
Ques.	21	22	23	24																
Ans.	D	D	1210	D																
Ques.	25		$A \rightarrow P,R,S$			$B \rightarrow Q, S$			$C \rightarrow Q, S$			$D \rightarrow P,R,S$								

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

SECTION-B