QUADRATIC EXPRESSIONS & EQUATIONS

- QUADRATIC EXPRESSION : If $a \neq 0,$, b, c are complex numbers then ax^2+bx+c is called a quadratic expression in x
- QUADRATIC EQUATION: If $a \neq 0$, b, c are complex numbers then $ax^2+bx+c=0$ is called a quadratic equation in x.
- QUADRATIC IDENTITY: $ax^2+bx+c=0$ will be an identity (or can have more than two solutions) if a = 0, b=0, c=0.
- ROOT OF A QUADRATIC EQUATION: If $a\alpha^2+b\alpha+c=0$ then α is a root or solution of the quadratic equation ax^2+bx+c =0.
  A Quadratic equation can not have more than two roots or two solutions. The roots of $ax^2+bx+c=0$ are $\frac{-b \pm \sqrt{b^2-4ac}}{2a}$ and its discriminent is $\Delta = b^2-4ac$.
- Nature of the roots of the equation $ax^2+bx+c=0$
  - a, b, c are real and
  - $\Delta > 0$, then the roots are real and distinct
  - $\Delta = 0$, then the roots are real and equal
  - $\Delta < 0$, then the roots are two conjugate complex numbers.
  - a, b, c are rational and
  - $\Delta > 0$, and is a perfeact square then the roots are rational and distinct.
  - $\Delta > 0$, and is not a perfect square then the roots are conjugate surds i.e, $\alpha \pm \sqrt{\beta}$.
  - $\Delta = 0$, then the roots are equal & rational
  - $\Delta < 0$, then the roots are conjugate complex numbers. i.e, $\alpha \pm i\beta$
- FORMATION OF THE QUADRATIC EQUATION WITH ROOTS ARE α AND β : The quadratic equation whose roots are α and β is
  $x^2-(\alpha+\beta)x+\alpha\beta=0 \Rightarrow (x-\alpha)(x-\beta)=0$
- RELATION BETWEEN THE ROOTS α, β OF $ax^2+bx+c=0$
  - $\alpha+\beta=\frac{-b}{a}, \quad \alpha\beta=\frac{c}{a}$
  - $|\alpha-\beta| = \frac{\sqrt{b^2-4ac}}{|a|}$
  - $\alpha^2+\beta^2=\frac{b^2-2ac}{a^2}$
  - $\alpha^3+\beta^3=\frac{3abc-b^3}{a^3}$
  - $\frac{1}{\alpha}+\frac{1}{\beta}=\frac{-b}{c}$
  - $\frac{1}{\alpha^2}+\frac{1}{\beta^2}=\frac{b^2-2ac}{c^2}$
  - $\frac{1}{(a\alpha+b)}+\frac{1}{(a\beta+b)}=\frac{b}{ac}$
  - $\frac{1}{(a\alpha+b)^2}+\frac{1}{(a\beta+b)^2}=\frac{b^2-2ac}{a^2c^2}$
  - $\frac{1}{(a\alpha+b)^3}+\frac{1}{(a\beta+b)^3}=\frac{b^3-3abc}{a^3c^3}$
  - $\left|\alpha^2-\beta^2\right|=\frac{|b|\sqrt{b^2-4ac}}{a^2}$
- PROPERTIES OF ROOTS OF THE EQUATION $ax^2+bx+c=0$
  - If a and c are of the same sign then $\frac{c}{a}$ is +ve then roots having same sign
  - If a and c are of the opposite signs that $\frac{c}{a}$ is -ve then roots have opposite sign
  - If both the roots are -ve then a, b, c will have the same sign.
  - If the roots are +ve then a, c will have the same sign different from the sign of b.
  - If a = c then the roots are reciprocal to each other
  - If a+b+c=0 then the roots are 1 and $\frac{c}{a}$
  - If a+c=b then the roots are -1 and $\frac{-c}{a}$

- If the roots are in the ratio m : n then $(m+n)^2 ac = mnb^2$.
- If one root is k times to the other root then $(1+k)^2 ac = kb^2$.
- If one root is equal to the n[th] power of the other root then

$$\left(ac^n\right)^{\frac{1}{n+1}} + \left(a^n c\right)^{\frac{1}{n+1}} + b = 0.$$

- If one root is square of the other then $a^2c + ca^2 = b\left(3ac - b^2\right)$

(xii) If roots are differ by unity, then $b^2 = 4ac + a^2$.

- SAME ROOTS: If $a_1x^2 + b_1x + c_1 = 0$ and $a_2x^2 + b_2x + c_2 = 0$ have the same roots then $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

- ONE ROOT IS COMMON: The equations $a_1x^2 + b_1x + c_1 = 0$ and $a_2x^2 + b_2x + c_2 = 0$ where $a_1b_2 - a_2b_1 \neq 0,$ $a_1, a_2 \neq 0$ have one common root then $(c_1a_2 - c_2a_1)^2 = (a_1b_2 - a_2b_1)(b_1c_2 - b_2c_1)$ and the common root is $\frac{c_1a_2 - c_2a_1}{a_1b_2 - a_2b_1}$.

- SIGNS OF '**a**' AND $\mathbf{ax^2 + bx + c}$:

  - If the equation $ax^2 + bx + c = 0$ has complex roots $(\Delta < 0)$ then a and $ax^2 + bx + c$ will have same sign $\forall\, x \in R$.

  - If the equation $ax^2 + bx + c = 0$ has equal roots then 'a' and $ax^2 + bx + c$ will have same sign $\forall\, x \in R - \left\{\frac{-b}{2a}\right\}$.

  - If the equation $ax^2 + bx + c = 0$ has real roots α and β $(\Delta > 0, \alpha < \beta)$ then

    - $\alpha < x < \beta \Leftrightarrow$ a and $ax^2 + bx + c$ will have opposite sign.

    - $x < \alpha$ or $x > \beta \Leftrightarrow$ a and $ax^2 + bx + c$ will have same sign.

- Maximum or Minimum value of Quadratic expression

  - If a > 0 then the minimum value of $ax^2 + bx + c$ at $x = \frac{-b}{2a}$ is $\frac{4ac - b^2}{4a}$.

  - If a < 0 then the maximum value of $ax^2 + bx + c$ at $x = \frac{-b}{2a}$ is $\frac{4ac - b^2}{4a}$.

- Location of real roots of the equation $f(x) = ax^2 + bx + c = 0\,(\Delta \geq 0)$. Whose roots are α, β

  - both roots are greater than k then $\alpha + \beta > 2k$, $(\alpha - k)(\beta - k) > 0$ or $\alpha + \beta > 2k$ and $a\,f(k) > 0$

  - both roots are less than k, then $\alpha + \beta < 2k$ and $(\alpha - k)(\beta - k) > 0$ or $\alpha + \beta < 2k$ and $a\,f(k) > 0$

  - k lies between the roots $(\alpha - k)(\beta - k) < 0$ or $a\,f(k) < 0$

- If α, β are the roots of $f(x) \equiv ax^2 + bx + c = 0$ then

S.No.	ROOTS	QUADRATIC EQUATION
1	$-\alpha, -\beta$	$f(-x) = 0$
2	$\frac{1}{\alpha}, \frac{1}{\beta}$	$f\left(\frac{1}{x}\right) = 0$
3	$k\alpha, k\beta$ $k \neq 0$	$f\left(\frac{x}{k}\right) = 0$
4	$\alpha + k, \beta + k$	$f(x - k) = 0$
5	α^2, β^2	$f(\sqrt{x}) = 0$
6	α^3, β^3	$a^3x^2 + (b^3 - 3abc)x + c^3 = 0$ or $f(\sqrt[3]{x}) = 0$
7	$\frac{\alpha}{1+\alpha}, \frac{\beta}{1+\beta}$	$f\left(\frac{x}{1-x}\right) = 0$

- Graph of $y = ax^2 + bx + c$

  - a > 0 and $b^2 - 4ac < 0$. Then the graph of $y = ax^2 + bx + c$ lies entirely above the x-axis.

- a > 0 and $b^2-4ac=0$ then the graph of $y=ax^2+bx+c$ touches the x-axis and lies entirely above the x-axis.
- if $b^2-4ac>0$ then the graph of $y=ax^2+bx+c$ cuts the x-axis at two distinct points.
- If a < 0 and $b^2-4ac<0$ then the graph of $y=ax^2+bx+c$ lies entirely below the x-axis.
- If a < 0 and $b^2-4ac=0$ then the graph of $y=ax^2+bx+c$ lies entirely below the x-axis and touches the x-axis

THEORETICAL

1. If the ratio of the roots of the equation $ax^2+bx+c=0$ is m : n then
1) $\frac{m}{n}+\frac{n}{m}=\frac{b^2}{ac}$ 2) $\sqrt{\left(\frac{m}{n}\right)}+\sqrt{\left(\frac{n}{m}\right)}=\frac{b}{\sqrt{ac}}$
3) $\sqrt{\left(\frac{m}{n}\right)}+\sqrt{\left(\frac{n}{m}\right)}=\frac{b^2}{ac}$ 4) $\frac{m}{n}+\frac{n}{m}=\frac{a^2}{b^2}$
2. A quadratic equation with rational coefficients can have
1) one root real, other imaginary
2) one root rational, other irrational
3) have negative and irrational roots
4) two roots
3. If a, b, c are positive then both roots of the equation $ax^2+bx+c=0$
1) are real and negative
2) are real and positive
3) have negative real parts
4) have postive real parts
4. If α, β are the roots of the equation $ax^2+bx+c=0$, then the value of $\frac{1}{a\alpha+b}+\frac{1}{a\beta+b}=$
1) $\frac{a}{bc}$ 2) $\frac{b}{ac}$ 3) $\frac{c}{ab}$ 4) $\frac{ab}{c}$
5. If the roots of $ax^2+bx+c=0$ and $px^2+qr+r=0$ differ by the same quantity, then $\frac{b^2-4ac}{q^2-4pr}=$
1) $\left(\frac{p}{a}\right)^2$ 2) $\left(\frac{c}{p}\right)^2$ 3) $\left(\frac{a}{p}\right)^2$ 4) $\left(\frac{p}{c}\right)^2$
6. In a quadratic equation $ax^2+bx+c=0$ if ‘a’ and ‘c’ are of opposite signs and ‘b’ is real, then roots of the equation are
1) real and distinct 2) real and equal
3) imaginary 4) nonthing
7. If $ax^2+2bx+c=0$ and $px^2+2qx+r=0$ have one and only one root in common and a, b, c being rational, then b^2-ac and q^2-pr are
1) both are perfect squares
2) b^2-ac is a perfect square but q^2-pr is not a perfect square
3) q^2-pr is a perfect square but b^2-ac is not a perfect square
4) both are not perfect squares
8. If one root of a quadratic equation is real and the other is imaginary, then the coefficients of the equation are
1) real numbers 2) rational numbers
3) irrational numbers 4) complex numbers
9. If a $\neq$ b the roots of the equation (x-a) (x-b) = b^2 are
1) real and distinct 2) real and equal
3) real 4) imaginary
10. If a > 0, then the expression ax^2+bx+c is positive for all values of ‘x’ provided.
1) b^2-4ac > 0 2) b^2-4ac < 0
3) b^2-4ac = 0 4) b^2-ac < 0
11. If a > 0 and b^2-4ac < 0, then the graph of $y=ax^2+bx+c$
1) lies entirely below the x-axis
2) lies entirely above the x-axis
3) cuts the x-axis
4) touches the x-axis and lies below it
12. If a > 0 and b^2-4ac=0, then the graph of $y=ax^2+bx+c$
1) lies entirely above the x-axis
2) touches the x-axis and lies above it
3) touches the x-axis and lies below it
4) cuts the x-axis
13. If a < 0 and b^2-4ac < 0, then the graph of $y=ax^2+bx+c$
1) lies entirely below the x-axis
2) lies entirely above the x-axis
3) cut the x-axis 4) touches the x-axis
14. If b^2-4ac > 0 then the graph of $y=ax^2+bx+c$
1) cuts x-axis in two real points
2) touches the x-axis
3) lies entirely above the x-axis
4) can not be determined
15. If α, β are the roots of $ax^2+bx+c=0$ and $k\in R$ then the condition so that $\alpha<k<\beta$ is
1) ac > 0 2) $ak^2+bk+c>0$
3) ac < 0 4) $a^2k^2+abk+ac<0$
16. If a, b, c are positive numbers in G.P. then the roots of the equation $ax^2+bx+c=0$
1) are real and negative 2) have negative real parts
3) are equal 4) have negative imaginary parts

17. If both the roots of $ax^2+bx+c=0$ are positive then

1) Δ > 0, ab > 0, ac > 0
2) Δ < 0, ab < 0, ac < 0
3) Δ > 0, ab < 0, ac > 0
4) Δ > 0, ab > 0, bc > 0

18. If both the roots of ax^2+bx+c =0 are negative then

1) Δ > 0, ab > 0, bc < 0
2) Δ > 0, a, b, c, have the same signs
3) Δ < 0, ab > 0, ac < 0
4) Δ < 0, ab > 0, bc > 0

19. If the roots of $ax^2+bx+c=0$ are both negative and b < 0 then

1) a < 0, c < 0 2) a < 0, c > 0
3) a > 0, c < 0 4) a > 0, c > 0

KEY

1) 2	2) 4	3) 3	4) 2	5) 3
6) 1	7) 1	8) 4	9) 1	10) 2
11) 2	12) 2	13) 1	14) 1	15) 4
16) 2	17) 3	18) 2	19) 1	

HINTS

1. $\frac{b^2}{ac}=\frac{(m+n)^2}{mn} \Rightarrow \frac{m+n}{\sqrt{mn}}=\sqrt{\frac{b^2}{ac}}$

4. $a\alpha+b=-c/\alpha$; $a\beta+b=-c/\beta$

5. $\alpha-\beta=\alpha_1-\beta_1$

$\sqrt{\frac{\Delta}{a^2}}=\sqrt{\frac{\Delta_1}{p^2}} \Rightarrow \frac{b^2-4ac}{q^2-4pr}=\frac{a^2}{p^2}$

7. $ax^2+2bx+c=0$ and $px^2+2qx+r=0$ have one root common then it is rational other is also rational then $b^2-ac=$ perfect square and $q^2-pr=$ perfect square

11. b^2-4ac < 0 and a > 0 then the graph lies entirely above the x-axis.

12. b^2-4ac = 0 and a > 0 then the graph of y touches the x-axis and lies above x-axis.

13. a < 0 and $b^2-4ac<0$ the roots are imaginary then the graph lies entirely below the x-axis.

14. $b^2-4ac>0$ => roots are real $\therefore$ graphs cuts the x-axis in two distinct points.

15. $f(x)=ax^2+bx+c$

$a\,f(k)<0=<a^2k^2+abk+ac<0$.

16. $b^2=ac \;\therefore b^2-4ac<0 \;\therefore$ roots are imaginary . a,b,c are +ve $\Rightarrow$ roots have -ve real parts.

17. $\Delta>0$, ab < 0 and ac > 0

18. $\Delta>0$ anb ab > 0, ac > 0

19. a and c will have same sign and opposite sign of b

LEVEL -I

1. If α, β are the roots of $4x^2+3x+7=0$ then the value of $\frac{1}{\beta}+\frac{1}{\alpha}$ is

1) 3/7 2) -3/7 3) 4/7 4) -4/7

2. If α, β are the roots of $x^2-px+q=0$ then $\frac{\alpha^2+\beta^2}{\alpha^{-2}+\beta^{-2}}=$

1) p 2) q 3) p^2 4) q^2

3. If α, β are the roots of $x^2-p(x+1)+C=0$ then $(\alpha+1)(\beta+1)=$

1) 1-C 2) 1+C 3) C-1 4) C

4. If one root of the equation x^2-2x+k=0 is 1+2i, then the value of k is

1) -3 2) -5 3) 5 4) 3

5. If the roots of the equation x^2 - 15 - m(2x-8)=0 are equal then m =

1) 3, -5 2) 3, 5 3) -3, 5 4) -3, -5

6. If the sum of the roots of the equation $5x^2$-4x+2+k ($4x^2$-2x-1)=0 is 6, then k =

1) 13/17 2) 17/13 3) -17/13 4) -13/11

7. If one root of the equation ax^2+bx+c=0 where a, b, c are integers is $\sqrt{5}+3$, then the other root is

1) $\sqrt{5}-3$ 2) $3-\sqrt{5}$
3) $-3-\sqrt{5}$ 4) $2\sqrt{5}+3$

8. If one root of the equation $5x^2+13+k=0$ is the reciprocal of the other then

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

9. If $4-i\sqrt{3}$ is a root of quadratic equation, then the equation is

1) x^2-8x+13=0 2) x^2-8x+19=0
3) x^2-8x-13=0 4) x^2-8x-19=0

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

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

11. If one root of the equation $x^2+px+12=0$ is 4, while the equation $x^2+px+q=0$ has equal roots, the value of q is
1) 49/4 2) 4 3) 4/49 4) 49

12. If the equation $x^2-11x+a=0$ and $x^2-14x+2a=0$ have a common root, then a =
1) 0, 18 2) 0, 30 3) 18, 30 4) 0, 24

13. If $x^2+4ax+3=0$ and $2x^2+3ax-9=0$ have a common roots, then a =
1) 0 2) 1 3) -1 4) ±1

14. If one root of the equation $8x^2-6x+k=0$ is the square of the other, then k =
1) 0, 3 2) -1, 27 3) 0, -2 4) 1, -27

15. If the product of the roots of the equation $5x^2-4x+2+k(4x^2-2x-1)=0$ is 2, then k =
1) -8/9 2) 8/9 3) 4/9 4) -4/9

16. If x is real, then the minimum value of the expression $x^2-8x+17$ is
1) -1 2) -2 3) 2 4) 1

17. If x is real, then the maximum value of expression $7-(2x-3)^2$ is obtained when x =
1) 0 2) -3/2 3) 3/2 4) -2

18. If x is real, then the maximum value of the expression $5+4x-4x^2$ is
1) 6 2) -6 3) 12 4) -12

19. If x is real and $2x^2-4x+5 > 0$, then x lies in the interval
1) ϕ 2) $(-\infty, \infty)$ 3) $(0, \infty)$ 4) $(-\infty, 0)$

20. If x is real and $3+5x-2x^2 > 0$ then x lies in the interval
1) $\left(-\frac{1}{2}, 3\right)$ 2) $\left[-\frac{1}{2}, 3\right]$
3) $\left(-\infty, -\frac{1}{2}\right)$ 4) $\left(-\infty, -\frac{1}{2}\right)\cup(3, \infty)$

21. For 2 < x < 4, the sign of the expression x^2-6x+5 is
1) positive 2) negative
3) non negative 4) can not be determined

22. If x < 5, then the sign of the expression $2x+7-5x^2$ is
1) positive 2) negative
3) non negative 4) can not be determined

23. A root of equation $\frac{a+c}{x+a}+\frac{b+c}{x+b}=\frac{2(a+b+c)}{x+a+b}$ is
1) a 2) b 3) c 4) a+b+c

24. The equation formed by the increasing each root of $ax^2+bx+c=0$ by 1 is $2x^2+8x+2=0$ then
1) a+b=0 2) b+c=0 3) b=c 4) a=b

25. The number of solutions of the equation $x^{\frac{2}{3}}+x^{\frac{1}{3}}-2=0$ is
1) 1 2) 2 3) 3 4) 4

26. If a = 0 then the equation $\frac{x-a-1}{x-a}=a+1-\frac{1}{x-a}$ has
1) one root 2) two roots
3) many roots 4) no roots

27. If the roots of $x^2+bx+c=0$ are two consecutive integers then b^2-4c=
1) 0 2) 1 3) 2 4) 3

28. If $a(b-c)x^2+b(c-a)x+c(a-b)$ is a perfect square, then a, b, c are in
1) A.P. 2) G.P. 3) H.P. 4) A.G.P.

29. If one root of $x^2-(3+2i)x+(1+3i)=0$ is 1+i then the other root is
1) 1-i 2) 2+i 3) 3+i 4) 1+3i

30. If the arithmetic mean of the roots of a quadratic equation is 8/5 and the arithmetic mean of their reciprocal is 8/7 then the equation is
1) $5x^2+16x+7=0$ 2) $5x^2-16x+7=0$
3) $7x^2+16x+5=0$ 4) $7x^2-16x+5=0$

31. The roots of $ax^2+3bx+c=0$ are given by if 3b=a+c
1) 1, c/a 2) -1, c/a 3) -1, -c/a 4) 1, -c/a

KEY

1) 2	2) 4	3) 2	4) 3	5) 2
6) 4	7) 2	8) 2	9) 2	10) 1
11) 1	12) 4	13) 4	14) 4	15) 1
16) 4	17) 3	18) 1	19) 2	20) 1
21) 2	22) 2	23) 3	24) 3	25) 2
26) 3	27) 2	28) 3	29) 2	30) 2
31) 3				

HINTS

1. $\frac{\alpha+\beta}{\alpha\ \beta}=\frac{-3}{7}$

2. $\alpha^2\ \beta^2=q^2$

3. $\alpha\ \beta+(\alpha+\beta)+1=-p+c+p+1$ = c + 1

4. $k=(1+2i)\ (1-2i)$ = 5

5. $b^2=4ac$ => $4m^2=4(8m-15)$
$m^2-8m+15=0$; m=+3,+5

6. sum of the roots = 6
$\frac{2k+4}{5+4k}=6$ => $k=\frac{-13}{11}$

8. a = c => 5 = k

9. $4-i\sqrt{3},\ 4+i\sqrt{3}$ are the roots
$\alpha+\beta=8$ and $\alpha\ \ \beta=19$; $x^2-8x+19=0$

10. Roots of $Ax^2+Bx+C=0$ are 1 and C/A
if A+B+C=0 ∴ roots = 1, $\frac{c(a-b)}{a(b-c)}$

12. $(a_1b_2-a_2b_1)\ (b_1c_2-b_2c_1)=(c_1a_2-c_2a_1)^2$
$\therefore a=0,\ 24$

14. $a^2c+ac^2=3abc-b^3$
$\Rightarrow 64k+8k^2=-144k+216$
$\Rightarrow 8k^2+208k-216=0$
$\Rightarrow k^2+26k-27=0$

15. $\frac{2-k}{5+4k}=2$; 2-10 = 8k+k ; k = -8/9

16. $\frac{4ac-b^2}{4a}=\frac{68-64}{4}=1$

17. when x = $\frac{-b}{2a}$

18. $\frac{4ac-b^2}{4a}=\frac{-80-16}{4(-4)}=\frac{-96}{-16}=6$

19. $b^2-4ac=16-40<0$

20. $2x^2-5x-3<0$; $(2x+1)(x-3)<0$

$x\in(-½, 3)$

21. $x^2-6x+5=0$ roots are 1 and 5 ;

1 < x < 5 => $x^2-6x+5<0$

22. $5x^2-2x-7=0$; $5x^2+5x-7x-7=0$

$(x+1)(5x-7)=0$ x = -1,

x=7/5 => $2x+7-5x^2<0$

24. $(\alpha+1)(\beta+1)=1\Rightarrow \alpha\beta=-(\alpha+\beta)$

$\Rightarrow \frac{c}{a}=\frac{b}{a}$ => $b=c$

27. $\alpha=n,\ \beta=n+1$; b = -2n-1

c = n^2 + n $\therefore b^2-4c=1$

28. $1=\frac{c(a-b)}{a(b-c)}$ => $ab+bc=2ac$;

a, b, c are in H.P.

29. $\alpha+\beta=3+2i$ $\beta=3+2i-1-i$ = 2+i

30. $\frac{\alpha+\beta}{2}=8/5$; $\alpha+\beta=16/5$

$\frac{1}{\alpha}+\frac{1}{\beta}=\frac{16}{7}$; $\frac{16}{5}\times\frac{7}{16}=4$; $\alpha\beta=7/5.$

The equation is $5x^2-16x+7=0$

31. Roots = -1, -c/a

LEVEL - 2

1. If α, β are the roots of $ax^2+2bx+c=0$ then $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}=$

1) $\frac{2(2b^2-ac)}{ac}$ 2) $\frac{4(b^2-ac)}{ac}$

3) $\frac{4(b^2-ac)}{a^2c^2}$ 4) $\frac{4(b^2-ac)}{a}$

2. The number of real solutions of the equation $x^2-7|x|+12=0$ is

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

3. If the difference of the squares of the roots of equation $x^2-6x+q=0$ is 24, then the value of q is

1) -7 2) 8 3) 5 4) 4

4. The quadratic equation whose roots are $\frac{\sqrt{2}+\sqrt{3}i}{\sqrt{2}-\sqrt{3}i}$ and $\frac{\sqrt{2}-\sqrt{3}i}{\sqrt{2}+\sqrt{3}i}$ is

1) $5x^2-2x+5=0$ 2) $5x^2+2x+5=0$

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

5. If α, β are the roots of the equation $2x^2+3x-4=0$, then the equation whose roots are $3\alpha+4\beta;\ 4\alpha+3\beta$ is

1) $2x^2+21x+50=0$ 2) $2x^2-21x+50=0$

3) $2x^2+21x+58=0$ 4) $2x^2-21x+58=0$

6. If α, β are the roots of $x^2-x+1=0$ then $\alpha^5+\beta^5=$

1) 2 2) 1 3) 12 4) 4

7. If one root of the equation $ax^2+bx+c=0$ is the square of the other, then

1) $b^2+ac^2+a^2c=3abc$ 2) $b^3+ac^2+a^2c=3abc$

3) $b^2+ac^2+a^2c+3abc=0$ 4) $b^3+ac^2+a^2c+3abc=0$

8. If α, β are the roots of the equation $x^2+px+q=0$ then the equation whose roots $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ is

1) $qx^2+(p^2-2q)x+q=0$ 2) $qx^2+(p^2-2q)x-q=0$

3) $qx^2-(p^2-2q)x-q=0$ 4) $qx^2-(p^2-2q)x+q=0$

9. If the roots of the equation $ax^2+bx+c=0$ are in the ratio m : n; then

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

3) $mnb^2=(m+n)^2ac$ 4) $mnb=(m+n)^2ac$

10. If the sum of the roots of the equation $ax^2+bx+c=0$ is equal to sum of their squares, then

1) $ab+b^2+2ac=0$ 2) $ab+a^2+2ac=0$

3) $ab+b^2-2ac=0$ 4) $ab+a^2-2ac=0$

11. If the roots of the equation $\frac{1}{x+p}+\frac{1}{x+q}=\frac{1}{r}$ are equal in magnitude but opposite in sign, then the product of the roots is equal to

1) $\frac{p^2+q^2}{2}$ 2) $-\left(\frac{p^2+q^2-4pq}{2}\right)$

3) $-\left(\frac{p^2+q^2}{2}\right)$ 4) $\frac{p^2-q^2}{2}$

12. If the ratio of the roots of $ax^2+2bx+c=0$ is same as the ratio of the roots of $px^2+2qx+r=0$ then

1) $\frac{b^2}{ac}=\frac{p^2}{qr}$ 2) $\frac{b}{ac}=\frac{q}{pr}$

3) $\frac{b^2}{ac}=\frac{q^2}{pr}$ 4) $\frac{b}{ac}=\frac{q^2}{pr}$

13. If α, β are the roots of the equation $x^2-px+q=0$ and α^3, β^3 are the roots of $x^2-ax+b=0$, then the relation between the coefficeints is
1) $p^3=a+3pq$ 2) $p^3=3a-3pq$
3) $p^3=3a+4pq$ 4) $p=a+3pq$

14. If the roots of the equation $ax^2+bx+c=0$ are the reciprocals of the roots of the equation $px^2+qx+r=0$, then
1) $acq^2 = b^2 pr$ 2) $ac = pr$
3) $b^2ac = q^2 pr$ 4) $ab = pq$

15. If the roots of the equation $(b-c) x^2 + (c-a) x + (a-b) = 0$ are equal, then a, b, c are in
1) A.P. 2) G.P. 3) H.P. 4) A.G.P

16. If the roots of $a (b-c)x^2 + b(c-a) x + c(a-b) = 0$ are equal, then a, b, c are in
1) A.P. 2) G.P. 3) H.P. 4) A.G.P

17. The value of λ in order that the equations $2x^2+5\lambda x+2=0$ and $4x^2+8\lambda x+3=0$ have a common root is given by
1) 1 2) -1 3) ± 1 4) 2

18. If the quadratic equation $ax^2+2cx+b=0$ and $ax^2+2bx+c=0$ $(b \neq c)$ have a common root, then $a+4b+4c=$
1) -2 2) -1 3) 0 4) 1

19. If the two equations $x^2-cx+d=0$ and $x^2-ax+b=0$ have a common root and the second equation has equal roots, then
1) b+d = ac 2) 2 (b+d) = ac
3) b+d=2ac 4) $(b+d)^2=a+c$

20. If the coefficient of x in the quadratic equation $x^2+px+q=0$ was taken as 17 in place of 13, its roots were found to be -2 and -15 the roots of the original equation are
1) 4, 9 2) -4, -9 3) 3, 10 4) -3, -10

21. If the difference of the roots of the equation $ax^2-bx+c=0$ is equal to the differecne of the roots of the equation $x^2-cx+b=0$ and $b \neq c$, then b+c=
1) 0 2) 2 3) 4 4) – 4

22. The condition that one root of the equation $ax^2+bx+c=0$ exceeds the other by p is
1) $a^2 p^2 = 4ac$ 2) $a^2 p^2 = b^2+4ac$
3) $a^2 p^2 = b^2 - 4ac$ 4) $ap = b^2+4ac$

23. If x, y, z are real and distinct, then $x^2+4y^2+9z^2-6yz-3zx-2xy$ is always
1) positive 2) non negative
3) negative 4) zero

24. If the roots of $px^2+2qx+r=0$ and $qx^2-2\sqrt{pr}\ x+q=0$ are simultaneously real, then
1) $p=q;\ r \neq 0$ 2) $2q=\sqrt{pr}$
3) $pr=q^2$ 4) pr=q

25. If $\alpha \neq \beta$ but $\alpha^2=2\alpha-3;\ \beta^2=2\beta-3$, then the equation whose roots are $\frac{\alpha}{\beta}$ and $\frac{\beta}{\alpha}$ is
1) $2x^2 + 3x + 2=0$ 2) $3x^2 + 2x + 3 = 0$
3) $2x^2 - 3x + 2 = 0$ 4) $3x^2 - 2x + 3 =0$

26. If α, β are the roots of $ax^2+bx+c=0$ then the value of $\left(\frac{\beta}{a\alpha+b}\right)^4-\left(\frac{\alpha}{a\beta+b}\right)^4$ is
1) 0 2) $\frac{1-a}{a^4}$ 3) $\frac{1+a}{a^3}$ 4) none

27. If α, β ar the roots of $3x^2 + 5x - 7 = 0$, then the value of $\left(\frac{1}{3\alpha+5}\right)^2+\left(\frac{1}{3\beta+5}\right)^2$ is
1) $\frac{67}{63}$ 2) $\frac{67}{441}$ 3) $\frac{109}{441}$ 4) $\frac{109}{63}$

28. If the roots of the equation $12x^2 + mx +5=0$ are in the ratio 5 : 4, then m =
1) $9\sqrt{3}$ 2) $\pm 9\sqrt{3}$ 3) $6\sqrt{3}$ 4) $\pm 6\sqrt{3}$

29. If the expression $x^2-(5m-2)x+\left(4m^2+10m+25\right)$ can be expressed as a perfect square, then m =
1) $\frac{8}{3}$ or 4 2) $-\frac{8}{3}$ or 4 3) $\frac{4}{3}$ or 8 4) $-\frac{4}{3}$ or 8

30. If the equation $k\left(6x^2+3\right)+rx+\left(2x^2-1\right)=0$ and $6k\left(2x^2+1\right)+px+\left(4x^2-2\right)=0$ have both roots common, then the value of p / r is
1) 1/2 2) 2 3) 1 4) 4

31. If α, β are the roots of $x^2 + px - q = 0$ and γ, δ that of $x^2+px+r=0$, then $(\alpha-\gamma)(\beta-\gamma)(\alpha-\delta)(\beta-\delta)$ =
1) $(q-r)^2$ 2) $(q+r)^2$
3) $-(q+r)^2$ 4) $-(q-r)^2$

32. If α, β are the roots of the equation $x^2+mx+l=0$ and γ, δ that of $x^2+nx+l=0$, then the value of $(\alpha-\gamma)(\beta-\gamma)(\alpha-\delta)(\beta-\delta)$ =
1) $l\,(m+n)^2$ 2) $-l\,(m+n)^2$
3) $l\,(m-n)^2$ 4) $1^2(m+n)$

33. If α, β are the roots of $x^2+px+1=0$ and γ, δ that of $x^2+qx+1=0$, then the value of $(\alpha-\gamma)(\alpha-\delta)(\beta+\gamma)(\beta+\delta)$ =

1) p^2-q^2 2) q^2-p^2

3) p^2+q^2 4) $(p+q)^2$

34. Both the roots of the equation (x-b) (x-c) + (x-c) (x-a) + (x-a) (x-b) = 0 are
1) positive 2) negative 3) real 4) imaginary

35. The roots of the equation
$(b-c)x^2+2(c-a)x+(a-b)=0$ are always
1) real and distinct 2) real and equal
3) real 4) imaginary

36. If each root of the equation $3x^2-7x+4=0$ is increased by 2, then the resulting equation is
1) $3x^2-19x+30=0$ 2) $3x^2+5x+2=0$
3) $3x^2-19x+2=0$ 4) $3x^2-19x+20=0$

37. If each root of the equation $x^2+11x+13=0$ is diminished by 4, then the resulting equation is
1) $x^2+3x-15=0$ 2) $x^2+3x+73=0$
3) $x^2+19x+73=0$ 4) $x^2-3x-4=0$

38. 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
1) 3 2) -3 3) -1 4) 1

39. If $6x^2+x-2>0$, then x lies in the interval
1) $\left(-\frac{2}{3},\frac{1}{2}\right)$
2) $\left(-\infty,\frac{-2}{3}\right)\cup\left(\frac{1}{2},\infty\right)$
3) $\left(-\infty,-\frac{1}{2}\right)\cup\left(\frac{2}{3},\infty\right)$ 4) $\left(-\frac{1}{2},\frac{2}{3}\right)$

40. If x is real and $\frac{x-1}{4x+5}<\frac{x-3}{4x-3}$ then x lies in the interval
1) $\left(-\frac{3}{4},\frac{5}{4}\right)$ 2) $\left(-\frac{5}{4},-\frac{3}{4}\right)$
3) $\left(-\frac{5}{4},\frac{3}{4}\right)$ 4) $\left(-\frac{3}{4},\frac{7}{5}\right)$

41. If x is real and $(x^2-3x+2)(x^2-x+7)<0$ then x lies in the interval
1) $(-\infty,1)\cup(2,\infty)$ 2) (1, 2)
3) [1, 2] 4) (3, 4)

42. Which of the following Means of roots of the equation $x^2-2bx+a^2=0$ is the A.M. of roots of $x^2-2ax+b^2=0$
1) A.M. 2) G.M. 3) H.M. 4) A.G.P

43. The integral solutions of the inequality $5x-1<(x+1)^2<7x-3$ are
1) 3, 4 2) 2, 3 3) 3 4) 2, 3, 4

44. If $\left(7+4\sqrt{3}\right)^{x^2-8}+\left(7-4\sqrt{3}\right)^{x^2-8}=14$, then x=
1) $3,\sqrt{7}$ 2) ± 3 ; ± 1
3) $\pm3;\pm\sqrt{7}$ 4) $\pm3,\pm4$

45. If α,β are the roots of $x^2+2x+4=0$, then $\alpha^6+\beta^6$ =
1) 128 2) 64 3) 192 4) -128

46. If α,β are the roots of $x^2-px+q=0$ then the equation whose roots are $\alpha\beta+\alpha+\beta.\alpha\beta-\alpha-\beta$ is
1) $x^2+2qx+p^2q^2=0$
2) $x^2-2qx+p^2+q^2=0$
3) $x^2-2qx+q^2-p^2=0$
4) $x^2+2qx+q^2-p^2=0$

47. The number of solutions of the equations $ax+by=1,\ cx^2+dy^2=1,\ a^2d+b^2c=cd$ is
1) 1 2) 2 3) 4 4) 0

48. If $\sin\theta,\sin k\theta$ are the roots of $4x^2+2x-1=0$, then θ
1) -18^0 2) 18^0 3) 36^0 4) 54^0

49. If a+b+c=0, the equation $3ax^2+2bx+c=0$ has
1) imaginary roots 2) real and equal roots
3) real and different roots
4) rational roots

50. If $\sin\theta,\cos\theta$ are the roots of the equation $ax^2+bx+c=0$ then
1) $a^2-b^2+2ac=0$ 2) $a^2+b^2+2ac=0$
3) $a-b+2ac=0$ 4) $a+b+2c=0$

51. The condition that a root of the equation $ax^2+bx+c=0$ may be reciprocal to a root of $a_1x^2+b_1x+c_1=0$ is
1) $(bb_1-aa_1)^2=(ab_1-bc_1)(ba_1-b_1c)$
2) $(cb_1-ba_1)^2=(ac_1-cd_1)(ab_1-bc_1)$
3) $(cc_1-aa_1)^2=(ab_1-bc_1)(ba_1-b_1c)$
4) a + b + c = 0

52. If $pr=2(q+s)$ then among the equations $x^2+px+q=0$ and $x^2+rx+s=0$
1) both have real roots
2) both have imaginary roots
3) at least one has real roots
4) at least one has imaginary roots

53. The condition that the roots of $\frac{x-a}{ax+1}-\frac{x+b}{bx+1}=0$ are reciprocal to each other is
1) a = 0 2) a + b = 0
3) a - b = 0 4) b = 0

54. The harmonic mean of the roots of the equation $\left(5+\sqrt{2}\right)x^2-\left(4+\sqrt{5}\right)x+\left(8+2\sqrt{5}\right)=0$ is
1) 2 2) 4 3) 6 4) 8

55. In a cricket match Anil took one wicket less than twice the number of wickets taken by Ravi. If the product of the number of wickets taken by them is 15, the number of wickets taken by each of them are
1) 5, 3 2) 3, 5 3) 2, 6 4) 7, 9

56. If $\alpha,\ \beta$ are the roots of $x^2+ax-b=0$ and $\gamma,\ \delta$ are the roots of $x^2+ax+b=0$, then the value of $(\alpha-\gamma)(\alpha-\delta)$ is
1) 2b 2) - 2b 3) a+b 4) a - b

57. The roots of the equation (a+c-b)x^2+2cx+(b+c-a) = 0 $(a \neq b)$ are
1) real and distinct 2) real and equal
3) real 4) imaginary

58. If x is real and $5x^2+2x+9 > 3x^2+10x+7$, then x lies in the interval
1) $\left(2-\sqrt{3},2+\sqrt{3}\right)$
2) $\left(-\infty,\ 2-\sqrt{3}\right)\cup\left(2+\sqrt{3},\ \infty\right)$
3) $\left(\sqrt{2}-1,\ \sqrt{2}+1\right)$ 4) $(2+\sqrt{3},\infty)$

59. The roots of the equation
(x-a) (x-b) + (x-b) (x-c) + (x-c) (x-a) =0 are real and equal if
1) a > b > c 2) a = b =c
3) a < b < c 4) a + b+ c =0

60. The expression
$(a-2)x^2+2(2a-3)x+(5a-6)$ is positive for all real values of x, then
1) 'a' can be any real number 2) a > 1
3) a > 3 4) a = 3

KEY

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

HINTS

1. $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}=\frac{(\alpha+\beta)^2-2\alpha\beta}{\alpha\beta}$

$=\frac{4b^2-2ac}{a^2.2ac}=\frac{2\left(2b^2-ac\right)}{ac}$

2. $(|x|-3)(|x|-4)=0$

3. $|\alpha^2-\beta^2|=24$

$\frac{|b|}{a^2}\sqrt{b^2-4ac}=24;\ \ 36-4q=16;\ q=5$

4. $\alpha+\beta=\frac{2(2-3)}{2+3}$; $\alpha\ \beta=1$

The equation is $5x^2+2x+5=0$

5. The quadratic equation is

$x^2-7(\alpha+\beta)x+\left(12(\alpha+\beta)^2+\alpha\ \beta\right)=0$

$x^2+\frac{21}{2}x+(27-2)=0$

$2x^2+21x+50=0$

6. $\alpha=-\omega,\ \beta=-\omega^2$; $\alpha^5+\beta^5=-\omega^2-\omega=1$

7. $\alpha+\alpha^2=-b/a;\ \alpha^3=c/a$

$\alpha^3+\left(\alpha^3\right)^2+3\alpha^3(-b/a)=\frac{-b^3}{c^3}$;

$\frac{c}{a}+\frac{c^2}{a^2}-\frac{3bc}{a^2}=\frac{-b^3}{a^3}$

$a^2c+ac^2=3abc-b^3$

8. $\frac{\alpha^2+\beta^2}{\alpha\ \beta}=\frac{p^2-2q}{q}$; $\frac{\alpha}{\beta}\times\frac{\beta}{\alpha}=1$

The equation is $qx^2-\left(p^2-2q\right)x+q=0$

9. $(m+n)\alpha=\frac{-b}{a}$; $mn\alpha^2=c\backslash a$

$\therefore\ \frac{b^2}{ac}=\frac{(m+n)^2}{mn}$

10. $\alpha+\beta=\alpha^2+\beta^2$; $\frac{-b}{a}=\frac{b^2-2ac}{a^2}$

$\therefore b^2+ab=2ac$

11. $\alpha+\beta=0$; $r(2x+p+q)=x^2+(p+q)x+pq$

$\therefore r=\frac{p+q}{2}$

$\alpha\ \beta = pq - r(p+q)$ => $pq - \frac{(p+q)^2}{2} = \frac{-p^2-q^2}{2}$

12. $\frac{(m+n)^2}{mn} = \frac{4b^2}{ac} = \frac{4q^2}{pr}$ => $\frac{b^2}{ac} = \frac{q^2}{pr}$

13. $\alpha^3+\beta^3 = a$; $(\alpha+\beta)^3 - 3\alpha\ \beta(\alpha+\beta) = a$

$p^3 - 3pq = a$

14. $cx^2+bx+a=0$; $px^2+qx+r=0$ have same roots $\therefore \frac{c}{p} = \frac{b}{q} = \frac{a}{r}$;

$\therefore ac/pr = b^2/q^2$

17. $(a_1b_2-a_2b_1)\ (b_1c_2-b_2c_1)$ = $(c_1a_2-c_2a_1)^2$

$\therefore 4\lambda^2 = 4 \Rightarrow \lambda = \pm 1$

19. $x^2-ax+b=0$; $\alpha = \frac{a}{2}, \alpha^2 = b$; put α in

$x^2-cx+d=0$; $\alpha^2 - c\alpha + d = 0$; $b+d = \frac{ac}{2}$

20. $x^2+13x+30=0$; $(x+10)\ (x+3)=0$;
x = -10, -3

21. $\frac{\Delta}{\Delta_1} = \frac{a^2}{p^2} \Rightarrow \frac{b^2-4ax}{c^2-4b} = 1$

$b^2-c^2 = 4c-4b$; b+c = -4

22. $|\alpha-\beta| = p \Rightarrow \frac{b^2-4ac}{a^2} = p^2$

23. $(x-2y)^2 + (2y-3z)^2 + (3z-x)^2 > 0$

24. $q^2 \ge pr$ and $pr \le q^2$; $\therefore q = pr$

25. $x^2-2x+3=0$ roots α, β

The quadratic equation is $x^2 - \frac{\alpha^2+\beta^2}{\alpha\ \beta}x + 1 = 0$

$x^2 - \frac{4-6}{3}x + 1 = 0$; $3x^2+2x+3=0$

26. $a\alpha + b = -c/\alpha$; $a\beta + b = -c/\beta$

27. $\frac{1}{(a\alpha+b)^2} + \frac{1}{(a\beta+b)^2} = \frac{b^2-2ac}{a^2c^2} = \frac{25+42}{9\times 49}$ = $\frac{67}{441}$

28. $\frac{(m+n)^2}{mn} = \frac{b^2}{ac} \Rightarrow \frac{81}{20} = \frac{m^2}{60}$; $m^2 = 81\times 3$;

$m = \pm 9\sqrt{3}$

29. $(5m-2)^2 - (4m^2+10m+25) = 0$

$9m^2-60m-96=0$; $3m^2-20m-32=0$

$3m^2-12m-8m-32=0$

$\Rightarrow (m-4)\ (3m-8)=0$ m = 4, 8/3

30. $\frac{6k+2}{12k+4} = \frac{r}{p} = \frac{3k-1}{6k-2}$ then verify

31. $(\gamma^2 - (\alpha+\beta)\gamma + \alpha\ \beta)(\delta^2 - (\alpha+\beta)\delta + \alpha\beta)$

= $(\gamma^2 + p\gamma - q)\ (\delta^2 + p\gamma - q)$

34. $3x^3 - 2(a+b+c)x + (ab+bc+ca) = 0$

$B^2 - 4AC = 4\left[(a+b+c)^2 - 3(ab+bc+ca)\right]$

$= 4\left[a^2+b^2+c^2-ab-bc-ca\right] \ge 0$

$\therefore$ roots are real.

35. $\Delta = 4(c-a)^2 - 4(b-c)(a-b)$

$= 4\left[c^2+a^2-2ac-ab+b^2+ac-bc\right]$

= $4\left[a^2+b^2+c^2-ab-bc-ca\right] \ge 0$

36. $3(x-2)^2 - 7(x-2) + 4 = 0$

$3x^2-12x+12-7x+14+4=0$

$3x^2-19x+3=0$

37. $(x+4)^2 + 11(x+4) + 13 = 0$

$x^2+8x+16+11x+44+13=0$

$x^2+19x+73=0$

38. $S = (\alpha+\beta)^2 - 2\alpha\ \beta$

= $(a-2)^2 + 2(a+1)$ = a^2-2a+6 has least

$\therefore \frac{ds}{da} = 0 \Rightarrow a = 1$

39. $6x^2+x-2>0$; $(2x-1)\ (3x+2)>0$

roots = -2/3, 1/2 ; $x \in \left(-\infty, \frac{-2}{3}\right) \cup \left(\frac{1}{2}, \infty\right)$

40. $\frac{(x-1)\ (4x-3) - (x-3)(4x+5)}{(4x+5)\ (4x-3)} < 0$

$\frac{4x^2-7x+3-4x^2+7x+15}{(4x+5)\ (4x-3)} < 0$

$\therefore (4x+5)(4x-3)<0$; $\therefore x \in \left(\frac{-5}{4}, \frac{3}{4}\right)$

41. $(x^2-3x+2)<0$ because

$\Delta < 0$ then $\forall$ x $\in$R , $x^2-x+7>0$

$\therefore \quad x \in (1, 2)$

42. $\frac{\alpha+\beta}{2}=a$; $\alpha_1\beta_1=a^2 \Rightarrow \sqrt{\alpha_1\beta_1}=a$

$\therefore$ A.M. of roots of Ist equation = G.M. of roots of 2nd equation

43. by verification

44. $x^2-8=\pm 1$; $x=\pm 3, \sqrt{7}$

45. Roots are $2\omega, 2\omega^2$

$\alpha^6+p^6=2^6(w^6+w^{12})=2^7=128$

46. $m=q+p$; $n=q-p$

The quadratic equation with roots m and n is

$x^2-2qx+q^2-p^2=0$

47. $a^2l^2+b^2m^2=n^2$ then the line lx+my+n=0

touches the curve $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$. =>

$\frac{1}{c}.a^2+\frac{1}{d}.b^2=1 \quad d\,a^2+cb^2=cd.$

48. $\alpha, \beta=\frac{-2\pm\sqrt{4+16}}{8}=\frac{\sqrt{5}\pm 1}{4}$

$\alpha=\sin 18^0, \beta=\frac{\sqrt{5}+1}{4}=\sin 54^0$ =>

$\theta=18^0$; k =3

49. $\Delta=4b^2-4(3ac) \quad =4\left[b^2-3ac\right]$

$=4\left[(a+c)^2-3ac\right]$ = $4\left[a^2+c^2-ac\right]>0$

root are real and distinct

verify with a = 1, b = -2, c=1

50. $\sin\theta+\cos\theta=-b/a$; $\sin\theta \; \cos\theta=c/a$

$1+2\frac{c}{a}=\frac{b^2}{a^2}$; $a^2+2ac=b^2$

51. $ax^2+bx+c=0$ and $c_1x^2+b_1x+a_1=0$ have a common root then find the condition.

52. $\Delta_1+\Delta_2=p^2-4q+r^2-4s$

= $p^2+r^2-4(q+s)$ = p^2+r^2-2pr

= $(p-r)^2\geq 0$

with $\Delta_1\geq 0$ or $\Delta_2\geq 0$ at least one has real roots.

53. $bx^2+x-abx-a-ax^2-x-abx-b=0$

$(b-a)x^2-2abx-(a+b)=0$

$b-a=-a-b$; $b=0$

54. H.M. = $\frac{2ab}{a+b}=\frac{2(8+2\sqrt{5})}{4+\sqrt{5}}$ = 4

55. x y = 15 and x = 2y-1

5 and 3.

56. $\alpha^2=(r+8)\alpha+r8=\alpha^2+a\alpha+b$

α is the roots of $x^2+ax+b=0$; $\alpha^2+a\alpha=b$

$\therefore (\alpha-\gamma)(\alpha-\delta)=2b$

57. $\Delta=4c^2-4(b+c-a)(a+c-b)$

= $4\left[c^2-[c-(a-b)][c+a-b]\right]$

= $4\left[(a-b)^2\geq 0\right]$ and $a\neq b$ roots are real and distinct

58. $2x^2-8x+2>0$; $x^2-4x+1>0$

root = $\frac{4\pm\sqrt{16-4}}{2}=2\pm\sqrt{3}$

$=(-\infty, 2-\sqrt{3})\cup(2+\sqrt{3}, \infty)$

59. a = b = c

60. $\Delta < 0$ $(2a-3)^2-(a-2)(5a-6)<0$

$4a^2-12a+9-5a^2+16a-12<0$

$\Rightarrow -a^2+4a-3<0 \Rightarrow a^2-4a+3>0$

$\Rightarrow a\in(-\infty, 1)\cup(3, \infty)$

LEVEL-3

1. If α, β are the roots of the equation $ax^2+bx+c=0$ then the value of $(1+\alpha+\alpha^2)(1+\beta+\beta^2)$ is

1) positive 2) negative

3) non-negative 4) non positive

2. If α, β are the roots of the equation $ax^2+bx+c=0$, then the equation whose roots are $\frac{\alpha}{\beta^2}, \frac{\beta}{\alpha^2}$ is

1) $ac^2x^2+(3abc-b^3)x+a^2c=0$

2) $ac^2x^2+(3abc-b^3)x-a^2c=0$

3) $ac^2x^2-(3abc-b^3)x+a^2c=0$

4) $ac^2x^2-(3abc-b^3)x-a^2c=0$

3. If α, β are the roots of the equation $x^2 - ax + b$ =0, then the equation whose roots are $2\alpha + \frac{1}{\beta}, 2\beta + \frac{1}{\alpha}$ is

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

4. If α, β are the roots of the equation $x^2 + x + 1 = 0$ then the $\alpha^4 + \beta^4 =$

1) -1 2) 0 3) 1 4) 2

5. If the sum of the roots of the equation $ax^2+bx+c=0$ is equal to sum of the squares of their reciprocals, then bc^2, ca^2, ab^2 are in

1) A.P. 2) G.P. 3) H.P. 4) A.G.P

6. If a, b, c are non zero real numbers and the sum of the squares of the roots of the equation $ax^2 + bx + c = 0$ is equal to the sum of the reciprocals of its roots then $\frac{a}{b}, \frac{b}{c}, \frac{c}{a}$ are in

1) A.P. 2) G.P. 3) H.P. 4) A.G.P

7. If the quadratic equation $(b^2 + c^2)x^2 - 2(a+b)cx + (c^2 + a^2) = 0$ has equal roots, then

1) a, b, c are in G.P. 2) a, c, b are in G.P.
3) a, c, b, are in A.P. 4) a, b, c are in A.P.

8. The number of quadratic equations which are unchanged by squaring their roots is

1) 2 2) 4 3) 6 4) 8

9. If the roots of the equation $(a^2 - bc)x^2 + 2(b^2 - ca)x + (c^2 - ab) = 0$ are equal then the condition is

1) a + b + c =0 2) $a^3 + b^3 + c^3 - 3abc = 0$
3) a = 0 (or) $a^3 + b^3 + c^3 - 3abc = 0$
4) b = 0 (or) $a^3 + b^3 + c^3 - 3abc = 0$

10. Sum of the roots of the equation $(x-2)^2 - 2|x-2| - 15 = 0$ is

1) 4 2) 0 3) -4 4) 8

11. If the roots of the equation $x^2 - 2cx + ab = 0$ be real and unequal, the roots of the equation $x^2 - 2(a+b)x + (a^2+b^2+2c^2) = 0$ are

1) real and distinct 2) real and equal
3) real 4) imaginary

12. For all real values of p, the roots of the equation $\frac{1}{x} + \frac{1}{x-1} + \frac{1}{x-p} = 0$ are

1) real and distinct 2) real and equal
3) real 4) imaginary

13. If ,a b, c are in H.P. then the roots of the equation $ax^2 + 2bx + c = 0$ are

1) real and distinct 2) real and equal
3) real 4) imaginary

14. If α, β are the roots of $4x^2 + 7x + 2 = 0$, then the equation whose roots are α^2, β^2 is

1) $16x^2 - 33x + 4 = 0$ 2) $16x^2 + 33x + 4 = 0$
3) $4x^2 - 49x + 2 = 0$ 4) $16x^2 - 4x + 2 = 0$

15. If the roots of the equation $9x^2 + 4ax + 4 = 0$ are not real, then 'a' lies in the interval

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

16. If $ax^2 - (2a+3)x + (3+5a) = 0$ has no real roots, then 'a' lies in the inverval

1) $\left(-\frac{3}{4}, \frac{3}{4}\right)$ 2) $\left(-\infty, -\frac{3}{4}\right)$
3) $\left(-\infty, -\frac{3}{4}\right)$ 4) $\left(-\infty, -\frac{3}{4}\right) \cup \left(\frac{3}{4}, \infty\right)$

17. If (x-1) (x-2) (x+5) < 0, then

1) x < -3 ; 0 < x < 2 2) x < -5 ; 1 < x < 2
3) x > 2 ; -5 < x < 1 4) x < 1 ; -5 < x < 2

18. If x is real then the values of x which satisfy the inequalities $2x^2 - 9x + 4 < 0$; $x^2 - 5x + 6 < 0$ are

1) 2 < x < 3 2) ½ < x < 4
3) $2 \le x \le 3$ 4) $½ \le x \le 4$

19. If x is real and $x^2 - 2x + 3 > 0$; $2x^2 + 4x + 3 > 0$, then x lies in the interval

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

20. If x is real, then the greatest and least values of the expression $\frac{x^2 - 2x + 2}{x^2 + 3x + 9}$ are respectively

1) 2 and $-\frac{2}{27}$ 2) 2 and $\frac{2}{27}$
3) 2 and $\frac{1}{27}$ 4) 2 or 3

21. If x is real, the $\frac{(x-1)(x-3)}{(x-2)(x-4)}$ lien in the interval

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

22. If x is real, these $\frac{x+2}{2x^2 + 3x + 6}$ lies in the interval

1) $\left(\frac{1}{13}, \frac{1}{3}\right)$ 2) $\left[\frac{1}{13}, \frac{1}{3}\right]$
3) $\left(-\infty, \frac{1}{13}\right) \cup \left(\frac{1}{3}, \infty\right)$ 4) (1,2)

23. If x is real then the value of $\frac{x^2 - 2x + 9}{x^2 + 2x + 9}$ is

1) 2 2) < ½
3) lies between ½ and 2 4) (2,3)

24. For real values of x the expression $\frac{x^2-x+1}{x^2+x+1}$ takes values in interval

1) $\left[\frac{1}{3}, 3\right]$ 2) $\left(-\infty, \frac{1}{3}\right]$

3) $[3, \infty)$ 4) $[2, \infty)$

25. If the roots of $ax^2 + bx + c = 0$ are of the form $\frac{m+1}{m}, \frac{m+2}{m+1}$ then $(a+b+c)^2 =$

1) 0 2) 1

3) $b^2 - 4ac$ 4) 2 abc

26. The value of 'a' for which the quadratic equation $3x^2+2(a^2+1)x+(a^2-3a+2)=0$ possesses roots of opposite signs lies in

1) $(-\infty, 1)$ 2) $(-\infty, 0)$

3) (1, 2) 4) [1, 2]

27. If both roots of the equation $x^2 + x + a = 0$ exeed 'a', then

1) 2 < a < 3 2) a > 3

3) -3 < a < 3 4) a < -2

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

1) 1, -2, 2 2) 1, 2, 4 3) -2, 2, 4 4) -2, 2, 3

29. Number of rational roots of the equation $|x^2-2x-3|+4x=0$ is

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

30. For a > 0, all the real roots of the equation $x^2-3a|x-a|-7a^2=0$ are

1) 4a, 5a 2) -4a, 5a 3) -4a, -5a 4) 4a, -5a

31. Number of real roots of the equation $\sqrt{x}+\sqrt{x-\sqrt{1-x}}=1$ is

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

32. Number of rational roots of the equation $\sqrt{5x^2-6x+8}-\sqrt{5x^2-6x-7}=1$ is

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

33. Roots of the equation $\sqrt{3x^2-5x+4}+\sqrt{3x^2-5x-8}=6$ are

1) 3, -1 2) 3, 4/3 3) 3, -4/3 4) -1, -4/3

34. Roots of the equation $x^2-6x-\sqrt{x^2-6x-3}=5$ are

1) 1, 7 2) -1, -7 3) 1, -1 4) -1, 7

35. If $a=\cos\frac{2\pi}{7}+i\sin\frac{2\pi}{7}$, $\alpha=a+a^2+a^4$ and $\beta=a^3+a^5+a^6$, then α, β are roots of the equation

1) $x^2+x+1=0$ 2) $x^2+x+2=0$

3) $x^2+2x+2=0$ 4) $x^2+2x+3=0$

36. If the equation $x^2+ax+bc=0$ and $x^2+bx+ca=0$ have a common root, then their other roots satisfy the equation

1) $x^2+(a+b+c)x+ab=0$

2) $x^2+cx+ab=0$ 3) $x^2-cx+ab=0$

4) $x^2+(a+b)x+ab=0$

37. If n is a multiple of 6 and α, β are the roots of $x^2+x+1=0$, then $(1+\alpha)^{-n}+(1+\beta)^{-n}=$

1) 2 2) -2 3) 0 4) -1

38. If α, β are the roots of $x^2-p(x+1)-c=0$ then $\frac{\alpha^2+2\alpha+1}{\alpha^2+2\alpha+c}+\frac{\beta^2+2\beta+1}{\beta^2+2\beta+c}=$

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

39. If α, β are the roots of $x^2+x+1=0$ and $S_n=\alpha^n+\beta^n$ then

$$\begin{vmatrix} 3 & 1+S_1 & 1+S_2 \\ 1+S_1 & 1+S_2 & 1+S_3 \\ 1+S_2 & 1+S_3 & 1+S_4 \end{vmatrix}=$$

1) 27 2) -27 3) -3 4) 9

40. If tan A, tan B are the roots of $x^2-2x+2=0$ then $\sin^2(A+B)=$

1) 4/5 2) 1/2 3) 3/5 4) 1/4

41. If every pair from among the equations $x^2+ax+bc=0$, $x^2+bx+ca=0$ and $x^2+cx+ab=0$ has common root, then the sum of the three common roots is

1) abc 2) 2abc

3) 3 (a+b+c) 4) (a+b+c)

42. a, b, c are rational. Then the roots of $(a+b+c)x^2-2(a+c)x+(a-b+c)=0$ are

1) real 2) equal

3) rational 4) imaginary

43. If |x-2| + |x-9| = 7, then x =

1) any real number between 0, 7

2) any real number between 2, 9

3) any real number between 2, 7

4) any real number between 0, 9

44. If $\cos\alpha$ is a root of $25x^2+5x-12=0$ and $(-1<x<0)$ then the value of $\sin 2\alpha$ =

1) 12/25 2) -12/25 3) 20/25 4) -24/25

45. If the equation $ax^2+bx+c=0$ is not altered when each of the coefficient is increased by the same quantity. Then $x^2+x+1=$

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

46. If the roots of the equation $x^2+2ax+b=0$ are real and distinct and they differ by atmost 2m, then 'b' lies in the interval

1) $\left(a^2-m^2, a^2\right)$ 2) $[a^2-m^2, a^2)$

3) $\left(a^2, a^2+m^2\right)$ 4) $\left(a^2+m^2, a^2\right)$

47. If α, β are the roots of the equation $\lambda\left(x^2-x\right)+x+5=0$ and if λ_1 and λ_2 are the two values of λ for which the roots , α, β are connected by the relation $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}=\frac{4}{5}$, then the value of $\frac{\lambda_1}{\lambda_2}+\frac{\lambda_2}{\lambda_1}=$

1) 2498 2) 54 3) 254 4) 48

48. If α, β are the roots of $ax^2+bx+c=0$ and $S_n=\alpha^n+\beta^n$ then $aS_{n+1}+bS_n+cS_{n-1}=$

1) 0 2) 1 3) 2 4) 5

49. x_1 and x_2 are the roots of the equation $Ax^2-4x+1=0$, x_3 and x_4 are the roots of the equation $Bx^2-6x+1=0$. If x_1, x_2, x_3, x_4 form a H.P. then (A, B) =

1) (3, 3) 2) (8, 8) 3) (3, 8) 4) (8, 3)

50. If $e^{\left(\cos^2 x+\cos^4 x+\cos^6 x+....\right)\log 3}$ satisfy $y^2-10y+9=0$ and $\left(0<x<\frac{\pi}{2}\right)$ then $\cot^2 x=$

1) 0 2) 1 3) 1/2 4) 9

51. if the sum of the square of the roots of the equation $x^2-(\sin\alpha-2)x-(1+\sin\alpha)=0$ is least, then $\alpha=$

1) $\pi/4$ 2) $\pi/3$ 3) $\pi/2$ 4) $\pi/6$

52. If α is a root of the equation $4x^2 + 2x - 1 = 0$ then the other root is given by

1) $-2\alpha-1$ 2) $4\alpha^2+\alpha-1$

3) $4\alpha^3-3\alpha$ 4) $4\alpha^2-3\alpha$

53. If α, β are the roots of $x^2 - 3x + a = 0$ and γ, δ that of $x^2 - 12x + b = 0$ and $\alpha, \beta, \gamma, \delta$ form an increasing G.P. then

1) a = 3, b = 12 2) a = 4, b = 16

3) a = 2, b = 32 4) a = 12, b = 3

54. The value of λ for which one root of the equation $x^2+(1-2\lambda)x+\left(\lambda^2-\lambda-2\right)=0$ is greater than 3 and the other is less than 3 is given by

1) $\lambda<2$ 2) $2<\lambda<5$

3) $\lambda>5$ 4) $\lambda>1$

KEY

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

HINTS

1. $1+\alpha+\alpha^2\geq 0$ because $\Delta<0$

$1+\beta+\beta^2\geq 0$ because $\Delta_1<0$

$\therefore \left(1+\alpha+\alpha^2\right)\left(1+\beta+\beta^2\right)\geq 0$

2. $m+n=\frac{\alpha^3+\beta^3}{\alpha^2\beta^2}=\frac{3abc-b^3}{a^3}\times\frac{a^2}{c^2}$

$mn=\frac{\alpha}{\beta^2}.\frac{\beta}{\alpha^2}=\frac{1}{\alpha\beta}=\frac{a}{c}$

The equation with roots of m and n is

$x^2-\frac{3abc-b^3}{ac^2}x+\frac{a}{c}=0$

$ac^2x^2-\left(3abc-b^3\right)x+a^2c=0$

$\frac{2b+1}{p}=x \Rightarrow p=\frac{2b+1}{x}$

$\frac{(2b+1)^2}{x^2}-\frac{a(2b+1)}{x}+b=0$

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

3. $\frac{2b+1}{p}=x \Rightarrow p=\frac{2b+1}{x}$

$\frac{(2b+1)^2}{x^2}-\frac{a(2b+1)}{x}+b=0$

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

4. $\alpha=\omega,\ \beta=\omega^2$

5. $\alpha+\beta=\frac{1}{\alpha^2}+\frac{1}{\beta^2}$

$\frac{c^2}{a^2}\left(-\frac{b}{a}\right)=\frac{b^2-2ac}{a^2}$

$ab^2+bc^2=2a^2c$

$\therefore bc^2, ca^2, ab^2$ are in A.P.

6. $\alpha^2+\beta^2=\frac{1}{\alpha^2}+\frac{1}{\beta^2}$

$\frac{b^2-2ac}{a^2}=\frac{-b}{c}$

$ba^2+cb^2=2ac^2 \Rightarrow 2c/b=a/c+b/a$

$\therefore \frac{a}{b},\frac{b}{c},\frac{c}{a}$ are in A.P.

7. do your self

8. $x^2=0,\quad x^2-x=0$

$x^2+x+1=0,\ x^2-2x+1=0$

9. $(b^2-ca)^2-(a^2-bc)(c^2-ab)=0$

=> $b(a^3+b^3+c^3-3abc)=0$

10. $(|x-2|-5)(|x-2|+3)=0$

$|x-2|=5, |x-2|+3\neq 0$

$x=\pm 5+2$ => x= 7, -3

11. $c^2=ab$ then

$\Delta=4\left[(a+b)^2-(a^2+b^2+2c^2)\right]$

$=4\left[2ab-2c^2\right]=0$

12. $3x^2-2(p+1)x+p=0$

$\Delta=4\left[(p+1)^2-3p\right]=4\left[p^2-p+1\right]\geq 0$

14. $m+n=\alpha^2+\beta^2=\frac{b^2-2ac}{a^2}=\frac{49-16}{16}=\frac{33}{16}$

$mn=\alpha^2\beta^2=\frac{4}{16}$

The equation of the roots α and β is

$x^2-\frac{33}{16}x+\frac{4}{16}=0$ => $16x^2-33x+4=0$

15. $\Delta<0 \Rightarrow 16a^2-16\times 9<0$; $a^2-9<0$

$\therefore a\in(-3, 3)$

16. $\Delta<0\Rightarrow(2a+3)^2-4a(3+5a)<0$

$\Rightarrow 4a^2+12a+9-12a-20a^2<0$

$\therefore a\in\left(-\infty, -\frac{3}{4}\right)\cup\left(\frac{3}{4}, \alpha\right)$

17. $\therefore x\in(-\infty, 1)\cup(2, 3)$

18. $2x^2-9x+4<0$ $\qquad x^2-5x+6<0$

$(x-4)(2x-1)<0$ $\qquad x\in(2, 3)$

$x\in\left(\frac{1}{2}, 4\right)$ $\qquad \therefore x\in(2,3)$

19. $x^2-2x+3>0$ $\qquad 2x^2+4x+3>0$

$\Delta=4-12<0$

$\Delta=16-24<0$

$x\in R$ $\qquad x\in R$

$\therefore x\in(-\infty, \infty)$

20. $x^2-2x+2=x^2y+3xy+9y$

$x^2(y-1)+x(2+3y)+(9y-2)=0$

x is real ; $\Delta\geq 0$

$(3y+2)^2-4(y-1)(9y-2)\geq 0$

$\Rightarrow 27y^2-56y+4\leq 0$

2, and 2/27

26. Product of roots < 0 ; $\Rightarrow a^2-3a+2<0$

$a\in(1, 2)$

27. $f(a)>0$ if a > 0

$a^2+2a>0$; $a(a+2)>0$

$a<-2$ or a > 0

28. by verification

29. $|(x+1)(x-3)|+4x=0$;

$-1<x<3$

$x\in(-\infty, 1)\cup(3, \infty)$ $\qquad -x^2+2x+3+4x=0$

$x^2-2x-3+4x=0$

$x^2-6x-3=0$

$x^2+2x-3=0$

$\frac{6\pm\sqrt{48}}{2}=3\pm\sqrt{12}$

(x+3) (x+1) = 0

$3+\sqrt{12}>3$ | $3-\sqrt{12}$

x = -3

30. by verification

31. $x-\sqrt{1-x}=1+x-2\sqrt{x}$

$1-x=1+4x-4\sqrt{x}$

$-5x=-4\sqrt{x}$ => $25x^2=16x$

$x=\frac{16}{25}$

32. $\sqrt{k+8}-\sqrt{k-7}=1$ when k = $5x^2$-6x

$2k+1+2\sqrt{(k+8)(k-7)}=$

$k^2+k-15=k^2$ => $k=15$

$5x^2-6x-15=0$

33. $\alpha=\omega+\omega^2+\omega^4,\ \beta=\omega^3+\omega^5+\omega^6$

$a, a^2, a^3, a^4, a^5, a^6$ are 7th roots of units.

$1+\omega+\omega^2+\omega^3+\omega^4+\omega^5+\omega^6=0$

The equation is $x^2+x+2=0$

36. by verify common roots is c

$\alpha=b,\ \beta=a$

The equation is $x^2-(a+b)x+ab=0$

and $a+b+c=0$; $x^2+cx+ab=0$

38. by taken $\alpha=1,\ \beta=-1$

p = 0, -1 = -p - c => c = 1

$\frac{\alpha^2+2\alpha+1}{\alpha^2+2\alpha+c}+\frac{\beta^2+2\beta+1}{\beta^2+2\beta+c}=\frac{4}{4}=1$

40. tan A + tan B = 2 ; tanA tan B = 2

$\tan\ (A+B)=\frac{2}{1-2}=-2$; $\sin^2(A+B)=\frac{4}{5}$

41. Common root of $x^2+ax+bc=0$ and $x^2+bx+ca=0$ is 'c'

common roof of $x^2+bx+ca=0$ and $x^2+cx+ab=0$ is 'a'

common root of $x^2+cx+ab=0$ and $x^2+ax+bc=0$ is 'b'

$\therefore$ Ans : a+b+c

43. If 2 < x < 9 then x-2 -x+9 = 7

44. $25x^2+20x-15x-12=0$

$5x(5x+4)-3(5x+4)=0$

$(5x+4)(5x-3)=0$

$\therefore x=-4/5,\ \sin\alpha=3/5$

$\sin 2\ \alpha=2\times\frac{3}{5}\times\frac{-4}{5}=\frac{-24}{25}$

45. $ax^2+bx+c=0$

$(a+k)x^2+(b+k)x+(c+k)=0$

$\therefore\ \frac{a+k}{a}=\frac{b+k}{b}=\frac{c+k}{c}$

$\frac{k}{a}=\frac{k}{b}=\frac{k}{c}\ \therefore\ a=b=c$

$\Rightarrow x^2+x+1=0$

46. $\Delta=a^2>b$ => $b<a^2$

$|\alpha-\beta|\le 2m$

$a^2-b^2\le m^2$ => $a^2-m^2\le b^2$

$b^2\ge a^2-m^2$; $b\ge a^2-m^2$

47. $\lambda\ x^2+(1-\lambda)x+5=0$

$\frac{\alpha^2+\beta^2}{\alpha\ \beta}=\frac{4}{5}$ => $\frac{(1-\lambda)^2}{\lambda^2\ \ 5/\lambda}=\frac{4}{5}$

$\lambda^2-12\lambda+1=4\lambda$; $\lambda^2-16\lambda+1=0$

$\frac{\lambda_1}{\lambda_2}+\frac{\lambda_2}{\lambda_1}=\frac{b^2-2ac}{a^2c}=256-2=254$

48. $ax^2+bx+c=0$

$a\alpha^2+b\alpha^4+c\alpha^{4-1}=0$

$a\beta^{n+1}+b\beta^n+c\ \beta^{n-1}=0$

=> $a\,S_{n+1}+b\,S_n+cS_{n-1}=0$

49. by taking one set of values and verify

50. $y^2-10y+9=0$

y = 1, y=9

$\cos^2 x+\cos^4 x+......$ => $x=\pi/2$

then $\cot^2\ x=0$

51. $S\equiv(\alpha^2+\beta^2)=(\alpha+\beta)^2-2\alpha\beta$

$=(\sin\ \alpha-2)^2+2(1+\sin\alpha)$

$=\sin^2\alpha-4\sin\alpha+4+2+2\sin\alpha$

$=\sin^2\ \alpha-2\ \sin\ \alpha+6$

$$\frac{ds}{d\alpha}=0 \Rightarrow 2\sin\alpha - 2=0$$

$$\sin\alpha=1\ ;\ \alpha=90^0$$

52. $4x^2+2x-1=0$

$$\alpha,\ \beta=\frac{-2\pm\sqrt{4+16}}{8}==\frac{-1\pm\sqrt{5}}{4}$$

$$\alpha=\frac{\sqrt{5}-1}{4}=\sin 18^0$$

$$\beta=-\left(\frac{\sqrt{5}-1}{4}\right)=-\sin 54^0$$

$$= -\left(3\alpha-4\alpha^3\right) = 4\alpha^3-3\alpha$$

53. by verification

54. $f(3)<0$

$$9+(1-2\lambda)3+\lambda^2-\lambda-2<0\ ;\qquad \lambda\in(2,5)$$

NEW PATTERN QUESTIONS:

1. I. If one root of the equation $5x^2+13x+k=0$ is the reciprocal of the other then k = 5
II. 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 H.P.
Which of the above statement is true?
1) only I 2) Only II
3) both I and II 4) neither I nor II

2. I. For 2 < x < 4 the sign of the expression x^2-6x+5 is negative.
II. For $x \notin [2, 4]$ the sign of the expression x^2-6x+5 is positive.
Which of the above statement(s) is(are) true?
1) only I 2) Only II
3) both I and II 4) neither I nor II

3. I. If f(x) be a quadratic expression which is positive for all real x and g(x) = f(x)+f '(x)+f ''(x) for any real x, then g(x) >0.
II. If the equations $px^2-7x+3p=0$ and $2x^2+qx+6=0$ have the same roots then pq=-14.
Which of the above statement(s) is(are) true?
1) only I 2) Only II
3) both I and II 4) neither I nor II

4. I. If c, d are the roots of the equation (x-a)(x-b)- k=0, then a,b are the roots of the equation (x-c)(x-d)+k =0.
II. If the equations $x^2+ax+b=0$ and $x^2+bx+a=0$ have a common root, then the value of a+b is 1.
Which of the above statement(s) is(are) true?
1) only I 2) Only II
3) both I and II 4) neither I nor II

5. i) x_1 and x_3 are the roots of the equation $Ax^2-4x+1=0$ and x_2 and x_4 are the roots of the equation $Bx^2-6x+1=0$. If x_1, x_2, x_3, x_4 form a H.P. then (A,B)= (3, 8).
ii) x_1 and x_2 are the roots of the equation $x^2-3x+A=0$ x_3 and x_4 are the roots of the equation $x^2-12x+B=0$ If x_1, x_2, x_3, x_4 form a G.P. then (A,B) = (2,32).
Which of the above statement is correct.
1) only i 2) only ii
3) both i and ii 4) neither i nor ii

6. (i) If α,β are the roots of $ax^2+bx+c=0$. If K is a real number [$K\neq 0,1$] then the equation whose roots are $k\alpha, k\beta$ is $ax^2+kbx+k^2c=0$.
(ii) 8,2 are roots of $x^2+ax+\beta=0$ and 3,3 are the roots of $x^2+\alpha x+b=0$ then the roots of $x^2+ax+b=0$ are 9, 1.
Which of the above statement is correct
1) only (i) 2) only (ii)
3) Both (i) and (ii) 4) Neither (i) nor (ii)

7. (i) If α,β are the roots of $x^2+Kx+2=0$. If $\alpha-\beta=1$ then K = ± 3
(ii) The difference of the roots of $x^2-bx+c=0$ is same as the difference of the roots of $x^2-cx+b=0$. If $b\neq c$ then b+c=-3.
Which of the above statement is correct.
1) only i 2) only ii
3) Both i and ii 4) Neither i nor ii

8. I: $\sqrt{2x+7}+\sqrt{x+4}=0$ has real roots.
II: $\sqrt{6-4x-x^2}=x+4$ has -1 only as the root.
Which of the above statement(s) is (are) true
1) only I 2) only II
3) both I and II 4) neither I nor II

9. I: $\sqrt{x+14}<x+2$ is true for $x\in(2,\infty)$.
II: The solution of the inequation $3^{x+2}>\left(\frac{1}{9}\right)^{1/x}$ is $(0,\infty)$
Which of the above statement(s) is (are) true?
1) only I 2) only II
3) both I and II 4) neither I nor II

10. I: If x +2 is factor of $x^2+2ax+b, x^2+2cx+d$, then $\frac{b-d}{a-c}=4$.
II: The equation whose roots are the squares of the roots of $x^2+4x+5=0$ is $x^2-6x+25=0$
Which of the above statement(s) is (are) true?
1) only I 2) only II
3) both I and II 4) neither I nor II

11. I : The roots of $a(b-c)x^2+b(c-a)x+c(a-b)=0$ are real and equal, then a,b,c are in G.P.
II: The number of solutions of $|x^2-2x+2|=3x-2$ is 4.
Which of the above statement(s) is (are) true?
1) only I 2) only II
3) both I and II 3) neither I nor II

12. I: If a,b,c are real, the roots of $(b-c)x^2+(c-a)x+(a-b)=0$ are real and equal, then a,b,c are in A.P.
II: If a,b,c are real, the roots of $\left(a^2+b^2\right)x^2-2b(a+c)x+b^2+c^2=0$ are real and equal, then a,b,c are in H.P.
Which of the above statement(s) is(are) true?
1) only I 2) only II
3) both I and II 4) neither I nor II

13. I: Maximum value of $-5x^2+2x+3$ is $\frac{17}{5}$
II: Minimum value of $3x^2-7x+9$ is $\frac{59}{6}$ at $x=-\frac{7}{6}$
Which of the above statement(s) is(are) true?
1) only I 2) only II
3) both I and II 4) neither I nor II

14. I: If $ax^2+2cx+b=0$ and $ax^2+2bx+c=0,(b\neq c)$ have a common root, then a+4b+4c=0.
II: a,b,c are all positive and not all equal and are in H.P., then the roots of $ax^2+2bx+c=0$ are complex numbers.
Which of the above statement(s) is(are) true?
1) only I 2) only II
3) both I and II 4)neitherI nor II

15. I: If α,β are the roots of $x^2-ax+b=0$, then the equation whose roots are $\frac{\alpha+\beta}{\alpha}, \frac{\alpha+\beta}{\beta}$ is $bx^2-ax+a^2=0$
II: If α,β are the roots of $x^2-bx+c=0$ and $a+h,b+h$ are the roots of $x^2+qx+r=0$, then h=b-q.
Which of the above statement(s) is(are) true.
1) only I 2) only II
3) both I and II 4) neither I and II

16. The arrangement of the following quadratic equations in the ascending order of their number of real roots.
A: $x^2-5x+6=0$ B: $x^2-7|x|=0$
C: $x^2-4x+5=0$ D: $x^2-5|x|+6=0$
1) C,A,B,D 2)D,C,B,A
3) A,D,B,C 4) D,A,B,C

17. The arrangement of the following quadratic equations in the descending order of their sum of the roots.
A: $x^2+11=0$ B: $(x+2)(x-3)=0$
C: $5x^2+4x=0$ D: $2x^2+3x-5=0$
1) A,B,C,D 2) D,C,B,A
3) B,A,C,D 4) A,C,B,D

18. If 3+4i is a root of $x^2+Ax+B=0$ and $\sqrt{3}-2$ is a root of $x^2+Cx+D=0$ then
1) A<C<D<B 2) A<D<C<B
3) A>C>D>B 4) A>D>C>B

19. A= The maximum value of $-4x^2+4x+5$
B=The minimum value of x^2-8x
C= The maximum value of $-x^2+4x-4$
D= The minimum value of $7x^2+100$ then
1) B<D<A<C 2) B<C<A<D
3) C<B<A<D 4) A<D<A<B

20. The arrangement of following quadratic expressions in the ascending order of their extreme values.
A: $\frac{11}{3}-\left(x-\frac{3}{5}\right)^2$ B: $x^2-8x+17$
C: $x^2+6x-27$ D: $15+4x-3x^2$
1) A,B,C,D 2) B,A,C,D
3) C,B,A,D 4) A,B,D,C

21. The arrangements of the following quadratic equation in the decending order of their sum of roots.
A: $x^2-3x+2=0$ B: $35x^2+13x-12=0$
C: $3x^2-5x+7=0$ D: $\sqrt{3}x^2+10x-8\sqrt{3}=0$
1) A,B,C,D 2) B,A,C,D
3) C,A,B,D 4) A,C,B,D

22. The arrangement of following quadratic expressions in the ascending order of their product of roots.
A: $3x^2-5x+7$ B: $\sqrt{3}x^2-10x-8\sqrt{3}=0$
C: $6x^2-5x+1$ D: x^2-5x+6
1) B,C,A,D 2) C,A,B,D
3) C,D,B,A 4) D,A,B,C

23. If $\frac{1}{2-i}$ is a root of $ax^2+bx+c=0$ and $\frac{1}{3-2\sqrt{2}}$ is a root of $px^2+dx+q=0$, then
1) a<b<d<c 2) d<a<b<c
3) d<b<c<a 4) b<d<c<a

24. If α,β are the roots of $ax^2+bx+c=0$ observe the following lists.

List-I	***List-II***
A: a,b,c have same sign	1. $\alpha\beta=1$
B: If a=c	2. -1
C: If a+b+c =0 then one root is	3. α and β are negative
D:If a+c=b then one root is	4. 0
	5. 1

The correct match for list-I from list-II is

	A	B	C	D
1)	1	3	2	5
2)	1	3	4	5
3)	3	1	5	4
4)	3	1	5	2

25. If α,β are the roots $ax^2+bx+c=0$ observe the following lists.

List-I	***List-II***
A: $\alpha+\beta$	1. b/a
B: $\alpha\beta$	2. -b/c
C: $\lvert\alpha-\beta\rvert$	3. $\frac{\sqrt{b^2-4ac}}{\lvert a\rvert}$
D: $\frac{1}{\alpha}+\frac{1}{\beta}$	4. c/a
	5. -b/a

The correct match for list-I from list-II is

	A	B	C	D		A	B	C	D
1)	5	4	3	1	2)	5	4	2	1
3)	1	2	3	4	4)	5	4	3	2

26. If α, β are the roots $ax^2+bx+c=0$ observe the following lists.

List-I	***List-II***
A: Maximum value of $f(x)=-x^2+5x-4$ is	1. -9/4
B: Minimum value of $f(x)=x^2+5x-4$ is	2. [1, 4]
C: $f(x) = x^2-5x+4$ has minimum at x =	3. 9/4
D: If $x^2-5x+4<0$ then x belongs to	4. (1, 4)
	5. 5/2

The correct match for list-I from list-II is

	A	B	C	D		A	B	C	D
1)	3	1	5	2	2)	3	1	5	4
3)	3	5	1	2	4)	4	3	5	1

27. If α, β are the roots of $ax^2+bx+c=0$ then observe the following lists

List-I	***List-II***
A) $\frac{\alpha}{\beta}+\frac{\beta}{\alpha}=$	1) $\frac{c^2}{a^2}$
B) $\frac{\alpha^2+\beta^2}{\alpha^{-2}+\beta^{-2}}=$	2) $\frac{c^5\left[3abc-b^3\right]}{a^8}$
C) $\alpha^3+\beta^3$	3) $\frac{b^2-2ac}{ac}$
D) $\alpha^5\beta^8+\alpha^8\beta^5=$	4) $\frac{3abc-b^3}{a^3}$
	5) -b/a

The correct match from List-I to List-II

	A	**B**	**C**	**D**		**A**	**B**	**C**	**D**
1)	3	1	4	2	2)	1	2	5	4
3)	2	3	4	5	4)	1	2	3	4

28. Observe the following lists

List-I (Inequation)	***List-II*** (Solution set)
A: $x^2-4x+3>0$	1. (3, 4)
B: $x^2-5x+6\leq 0$	2. $(-1,1)\cup(2,4)$
C: $x^2+6x-27>0$, $-x^2+3x+4>0$	3. $(-\infty,1)\cup(3,\infty)$
D: $x^2-3x-4<0$, $x^2-3x+2>0$	4. [3, 4]
	5. [2, 3]

Matching List-I, from List-II

	A	**B**	**C**	**D**		**A**	**B**	**C**	**D**
1)	1	2	3	4	2)	3	5	1	2
3)	1	3	5	4	4)	3	2	4	1

29. Observe the following lists:

List-I	***List-II***
1. $\sqrt{x^2-5x+6}<-3\Rightarrow x\in$	1. $\left[-2,\frac{1}{2}\right]$
2. $2-3x-2x^2\geq 0\Rightarrow x\in$	2. (-1, 2)
3. $x^2-3x+2>0,$ $x^2-3x-4\leq 0\Rightarrow x\in$	3. [-1, 2)
4. $\frac{x+1}{x-2}<0\Rightarrow x\in$	4. ϕ
	5. $[-1, 1)\cup(2, 4)$

The correct match for List-I from List-II is

	A	B	C	D		A	B	C	D
1)	4	1	5	2	2)	4	5	1	2
3)	1	2	3	4	4)	2	3	4	5

30. Assertion(A): x^2+x+1 is greater than zero for all real x.
Reason (R): When $b^2-4ac<0$. Then a, ax^2+bx+c have same sign for all real values of x.
1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are true and R is not the correct explanation of A.
3) A is true but R is false
4) A is false but R is true

31. Assertion (A): The curve $y = x^2 - 6x + 9$ touches the x-axis.
Reason(R): $y = ax^2+bx+c$ touches the x-axis iff $\Delta = b^2-4ac = 0$.
1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are true and R is not the correct explanation of A.
3) A is true but R is false
4) A is false but R is true

32. Assertion (A): The maximum value of $-x^2+3x+1$ is $\frac{11}{4}$.
Reason (R): If a <0, the maximum value of ax^2+bx+c is $\frac{4ac-b^2}{4a}$
1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are true and R is not the correct explanation of A.
3) A is true but R is false
4) A is false but R is true

33. Assertion (A) If $x^2-7x+10<0$ then $x\in(2, 5)$.
Reason (R): If 'a' and ax^2+bx+c have opposite signs and $b^2-4ac>0$ then x lies between the roots of $ax^2+bx+c=0$.
1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are true and R is not the correct explanation of A.
3) A is true but R is false
4) A is false but R is true

34. Assertion (A): The roots of (x-b)(x-c)+(x-c)(x-a)(x-b)=0 are real.
Reason(R): Above Quadratic equation discriminent value is positive or equal to zero.
1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are true and R is not the correct explanation of A.
3) A is true but R is false
4) A is false but R is true

35. Assertion(A): The roots of (b-c) x^2+ (c-a) x+ (a-b)=0 are equal then a,b,c are in A.P.
Reason(R): Roots are 1, $\frac{a-b}{b-c}$
1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are true and R is not the correct explanation of A.
3) A is true but R is false
4) A is false but R is true

36. Assertion (A): The equation $x-\frac{2}{x-1}=1-\frac{2}{x-1}$ has no root
Reason(R): x-1 $\neq$ 0, then only above equation defined.
1) Both A and R are true and R is the correct explanation of A.
2) Both A and R are true and R is not the correct explanation of A.
3) A is true but R is false
4) A is false but R is true

37. Assertion (A): For a quadratic equation in x, complex roots occur in conjugate pairs.
Reason(R): If $ax^2+bx+c=0$ and $2x^2+3x+4=0$ have a common root, then a : b : c =2 : 3 : 4
1) Both A and R are true and R is a consequence of A.
2) Both A and R are true and R is not a consequence of A.
3) A is true but R is false
4) Both A and R are false

38. Assertion (A):
f(x) $ax^2+bx+c,\ for\ a(\neq 0), b, c \in R$. When a>0 and b^2 -4ac <0, f(x)= 0 has complex roots.
Reason(R): The graph of f(x) = ax^2+bx+c cuts x-axis.
1) Both A and R are true and R is a consequence of A.
2) Both A and R are true and R is not a consequence of A.
3) A is true but R is false
4) Both A and R are false

KEY

1) 3	2)1	3)3	4)1	5)3
6)3	7)1	8)2	9)3	10)3
11)3	12)1	13)4	14)3	15)1
16)1	17)4	18)2	19)2	20)3
21)4	22)1	23)3	24)4	25)4
26)2	27)1	28)2	29)1	30)1
31)1	32)4	33)1	34)1	35)1
36)1	37)1	38)3		

PREVIOUS EAMCET QUESTIONS

EAMCET-2007

1. If α and β are the roots of the equation $ax^2+bx+c=0$ and if $px^2+qx+r=0$ has roote $\frac{1-\alpha}{\alpha}$ and $\frac{1-\beta}{\beta}$ then r = **(E-2007)**
1) a + 2b 2) a + b + c
3) ab + bc + ca 4) abc

2. The set of values of x for which the inequalities $x^2.3x-10<0, 10x-x^2-16>0$ hold simultaneously, is **(E-2007)**
1) $(-2,5)$ 2) $(2,8)$
3) $(-2,8)$ 4) $(2,5)$

EAMCET-2005

1. If x is real, then the minimum value of $\frac{x^2-x+1}{x^2+x+1}$ is
1) 1/3 2) 3 3) 1/2 4)1

2. E_1: a+b+c =0 if 1 is a root of ax^2+bx+c=0
E_2: b^2-a^2=2ac if sin θ cos θ are the roots of ax^2+bx+c=0
1) E_1 is true, E_2 is true 2) E_1 is true, E_2 is false
3) E_1 is false, E_2 is true 4) E_1 is false, E_2 is false

3. The roots of the equation x^3 -3x-2=0 are
1. -1, -1,+2 2) -1,1,-2
3) -1, -2,-3 4) -1, -1, -2

EAMCET-2004

4. $\sqrt{42+\sqrt{42+\sqrt{42+...}}}=$
1) 7 2)-6 3) 5 4)4

5. The set of all solutions of the inequation $x^2-2x+5\le 0$ is
1) $R-(-\infty,-5)$ 2) $R-(5,\infty)$
3) ϕ 4) $R-(-\infty,-4)$

6. If x-2 is a common factor of the expressions x^2+ax+b and x^2+cx+d, then $\frac{b-d}{c-a}=$
1) -2 2) -1 3) 1 4) 2

EAMCET-2003

7. The solution set contained in R of the inequation $3^x+3^{1-x}-4<0$ is
1) (1, 3) 2) (0, 1) 3) (1, 2) 4) (0, 2)

8. The minimum value of $2x^2$ +x-1 is
1) 1/4 2) 3/2 3) -9/8 4) 9/4

EAMCET-2002

9. If the equations $x^2+ax+b=0$ and $x^2+bx+a=0\,(a\neq b)$ have a common root then a+b=
1) -1 2) 2 3) 3 4) 4

10. If '3' is a root of $x^2+kx-24=0$ it is also root of

1) $x^2+5x+k=0$ 2) $x^2+kx+24=0$
3) $x^2-kx+6=0$ 4) $x^2-5x+k=0$

EAMCET-2001

11. If α, β are the roots of $x^2+bx+c=0$ and $\alpha+h, \beta+h$ are the roots of $x^2+qx+r=0$ then h =
1) b+q 2) b-q
3) $\frac{1}{2}(b+q)$ 4) $\frac{1}{2}(b-q)$

12. If $20^{3-2x^2}=\left(40\sqrt{5}\right)^{3x^2-2}$ then x =
1) $\pm\sqrt{\frac{13}{2}}$ 2) $\pm\sqrt{\frac{12}{13}}$ 3) $\pm\sqrt{\frac{4}{5}}$ 4) $\pm\sqrt{\frac{5}{4}}$

EAMCET-2000

13. If α, β are the roots of $9x^2+6x+1=0$ then the equation with the roots $1/\alpha,\ 1/\beta$ is
1) $2x^2+3x+18=0$ 2) $x^2+6x-9=0$
3) $x^2+6x+9=0$ 4) $x^2-6x+9=0$

14. The equation formed by decreasing each root of $ax^2+bx+c=0$ by 1 is $2x^2+8x+2=0$ then
1) a = -b 2) b = -c 3) c = -a 4) b=a+c

15. If (3 + i) is a root of the equation $x^2+ax+b=0$ then a =
1) 3 2) -3 3) 6 4) -6

1999

16. $2x-7-5x^2$ has maximum value at x=a, then a =
1) -1/5 2) 1/5 3) 34/5 4) -34/5

17. The maximum value of $c+2bx-x^2$ is
1) b^2c 2) b^2-c 3) $c+b^2$ 4) $c-b^2$

1998

18. The minimum value of $x^2-8x+17$, $\forall\ x \in$ IR is
1) 17 2) -1 3) 1 4) 2

1997

19. If α, β are the roots of the equation $ax^2+bx+c=0$, then the quadratic equation whose roots are $\alpha+\beta$: $\alpha\beta$ is
1) $a^2x^2+a(b-c)x+bc=0$ 2) $a^2x^2+a(b-c)x-bc=0$
3) $ax^2+(b+c)x+bc=0$ 4) $ax^2-(b+c)x-bc=0$

20. The minimum value of the quadratic expression $x^2+2bx+c$ is
1) cb^2 2) c^2b 3) $c+b^2$ 4) $c-b^2$

1996

21. If one root of the euation $ax^2+bx+c=0$ is 3-4i, then a+b+c=
1) 40a 2) 36a 3) -20a 4) 20a

22. If $x^2+6x-27>0$; $-x^2+3x+4>0$, then x lies in the interval
1) (3,4) 2) {3,4}
3) $(-\infty,3)\cup(4,\infty)$ 4) (-9,4)

1994

23. If α, β are the roots of $ax^2+bx+c=0$, then the equation whose roots are $2+\alpha$, $2+\beta$ is
1) $ax^2+x(4a-b)+4a-2b+c=0$
2) $ax^2+x(4a-b)+4a+2b+c=0$
3) $ax^2+x(b-4a)+4a+2b+c=0$
4) $ax^2+x(b-4a)+4a-2b+c=0$

24. If the ratio of the roots of $x^2+bx+c=0$ and $x^2+qx+r = 0$ is same, then
1) $r^2c=qb^2$ 2) $r^2b=qc^2$ 3) $rb^2=cq^2$ 4) $rc^2=bq^2$

25. If the ratio of 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

1993

26. If k>0 and the product of lthe roots of the equation $x^2-3kx+2e^{2\log k}-1=0$ is 7, then the sum of the roots is
1) 2 2) 4 3) 6 4) 8

27. For the equation $|x|^2+|x|-6=0$ the roots are
1) one and only one real number
2) real with sum one 3) real with sum zero
4) real with product zero

28. The number of solutions of the system of equations given below is $|x| + |y| = 1$; $x^2+y^2 = a^2$; $\left(\frac{1}{\sqrt{2}}<a<1\right)$.
1) infinite 2) 2 3) 4 4) 8

29. The value of the continued fraction
$1+\cfrac{1}{1+\cfrac{1}{1+\cdots\infty}}$ is
1) $\frac{\sqrt{5}-1}{2}$ 2) $\frac{\sqrt{5}+1}{2}$ 3) $\frac{\sqrt{5}-1}{4}$ 4) $\frac{\sqrt{5}+1}{4}$

30. If α, β are the roots of $x^2-(a-2)x-(a+1)=0$ where 'a' is a variable, then the least value of $\alpha^2+\beta^2$ is
1) 2 2) 3 3) 5 4) 7

31. If $x^2+4xy+4y^2+4x+cy+3$ can be written as the product of two linear factors, then c =
1) 2 2) 4 3) 6 4) 8

1992

32. The real roots of the equation $|x^2+4x+3|+2x+5=0$ are
1) 4;$-1+\sqrt{3}$ 2) -4 ; $-1-\sqrt{3}$ 3) -6,-1 4) 6,-1

1991

33. Two students while solving a quadratic equation in x, one copied the constant term incorrectly and got the roots as 3 and 2. The other copied the constant term and co-efficient of x^2 as-6 and 1 respectively. The correct roots are
1) 3,-2 2) -3,2 3) -6,-1 4) 6,-1

34. The greatest negative integer satisfying $x^2+4x-77<0$ and $x^2>4$ is
1) -1 2) -2 3) -3 4) -10

35. The condition for $ax^2+2cxy+by^2+2bx+2ay+c$ is resolvable into two linear facts is
1) $a^3+b^3+c^3=3abc$ 2) $a^3+b^3+c^3=abc$
3) $a^3+b^3+c^3=ab+bc+ca$ 4) $a^3+b^3+c^3+abc=0$

1989

36. The range of values of x which satisfy $5x+2<3x+8$ and $\frac{x+2}{x-1}<4$ are
1) (2,3) 2) $(-\infty, 2)$ 3) $(2, \infty,)$ 4) None

1998

37. For the equation $|x|^2 + |x| - 6 = 0$
1) There is only one real root
2) sum of the real roots is one
3) sum of the real roots is zero
4) product of the real roots is 4

1987

38. If 8 and 2 are the roots of $x^2 + ax + \beta = 0$ and 3,3 are the roots of $x^2 + \alpha x + b = 0$, then the roots of the equation $x^2 + ax + b = 0$ are
1) 8,-1 2) -9,2 3) 8,2 4) 9,1

1986

39. If one root of $x^2 - x - k = 0$ (k>0) is the square of the other root, then k=
1) $2 \pm \sqrt{5}$ 2) $2 + \sqrt{5}$ 3) $2 - \sqrt{5}$ 4) None

40. If $x^2 - hx - 21 = 0, x^2 - 3hx + 35 = 0$ (h>0) have a common root, then the value of h is
1) $\pm$ 2) ± 4 3) 4 4) 2

41. If 3+4i is a root of the equation $x^2 + px + q = 0$, then
1) p = 6; q = 7 2) p = 6; q = 1
3) p = – 6; q = – 7 4) p = – 6, q = 25

1984

42. If $2 + i\sqrt{3}$ is a root of $x^2 + px + q = 0$, then p = ..., q =.............
1) p = 4; q = 7 2) p = 4;q = –3
3) p = – 4;q = – 7 4) p = – 4, q = 7

43. If one root of the quation $ax^2 + bx + c = 0$ is double the other, then the relation between b,c is ....
1) $2b^2 = 9ac$ 2) $b^2 = ac$
3) $b^2 = 3ac$ 4) $b^2 = 9ac$

1983

44. If the quation $x^2 + bx + c = 0$ and $x^2 + cx + b = 0$ ($b \neq c$) have a common root then
1) b+c=0 2) b+c=1
3) b+c+1=0 4) None of these

45. If $ax^2 + bx + c = 0$ and $bx^2 + cx + a = 0$ have a common root and $a \neq 0$, then $\frac{a^3 + b^3 + c^3}{abc} =$
1) 1 2) 2 3) 3 4) 9

1982

46. If α, β are real and $\alpha^2, -\beta^2$ are the roots of the equation $a^2x^2 + x + (1 - a^2) = 0$ (a>1), then $\beta^2 =$
1) a^2 2) 1 3) $1 - a^2$ 4) $1 + a^2$

47. If one root of $px^2 - 14x + 8 = 0$ is 6 times the other, then p=................

1981

48. If α, β are the roots $ax^2 - 2bx + c = 0$ then $\alpha^3\beta^3 + \alpha^2\beta^3 + \alpha^3\beta^2 =$
1) $\frac{c^2}{a^3}(c + 2b)$ 2) $\frac{bc^3}{a^3}$
3) $\frac{c^3}{a^3}(c - 2b)$ 4) $\frac{bc}{a^3}$

49. If α, β are the roots of $x^2 - x + 2 = 0$ then $\alpha^3\beta + \alpha\beta^3 =$.........

1980

50. If α, β are the roots of $ax^2 + bx + c = 0$ then $\alpha\beta^2 + \alpha^2\beta + \alpha\beta =$
1) $\frac{c(a-b)}{a^2}$ 2) 0 3) $-\frac{bc}{a^2}$ 4) $-\frac{bc}{a}$

51. If α, β are the roots of $ax^2 + bx + c = 0$ of then $\alpha^3 + \beta^3$ =.............

1978

52. If α, β are the roots of $ax^2 + bx + c = 0$ then the value $\left(\frac{\alpha}{\beta} - \frac{\beta}{\alpha}\right)^2$ is ....

KEY

Eamcet-2007

1) 2 2) 4

1)1	2)1	3)1	4)1	5)3
6)4	7)2	8)3	9) 1	10) 2
11) 4	12) 2	13) 3	14) 3	15) 4
16) 2	17) 3	18) 3	19) 2	20) 4
21) 4	22) 1	23) 4	24) 3	25) 4
26) 3	27) 3	28) 4	29) 2	30) 3
31) 4	32) 2	33) 4	34) 3	35) 1
36) 1	37) 3	38) 4	39) 2	40) 4
41) 4	42) 4	43) 1	44) 3	45) 3
46) 2	47) p = 3	48) 1		

49) -6 50) 1 51) $\frac{3abc - b^3}{a^3}$

52) $\frac{b^2(b^2 - 4ac)}{a^2}$

QUESTIONS FROM IIT

1992

1. let α, β be the roots of the equation (x-a) (x-b)=c, $c \neq 0$ then the roots of the equation $(x - \alpha)(x - \beta) + c = 0$ are
1) a,c 2) b,c 3) a,b 4) a+b, b+c

1990

2. The number of real solutions of the equation $\sin(e^x) = 5^x + 5^{-x}$ is (are)
1) 0 2) 1 3) 2 4) Infinitely many

3. The equation $(\cos p - 1)x^2 + (\cos p)x + (\sin p) = 0$, in the variable x; has real roots. Then p can take any value in the Interval
1) $(0, 2\pi)$ 2) $(-\pi, 0)$
3) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ 4) $(0, \pi)$

1989

4. If α and β are the roots of $x^2 + px + q = 0$ and α^4, β^4 are the roots of $x^2 - rx + s = 0$, then the equation $x^2 - 4qx + (2q^2 - r) = 0$ has always
1) Two real roots 2) Two negative roots
3) Two positive roots
4) One Positive and one negative root

1988

5. If $|x^2 + 4x + 3| + 2x + 5 = 0$, then x=............

1987

6. If $\log_{2x+3}(6x^2+23x+21)=4-\log_{3x+7}(4x^2+12x+9)$ then x=

1986

7. If the quadratic equations $x^2+ax+b=0$, and $x^2+bx+a=0$ $(a \neq b)$ have a common root, then the numerical value of a+b is ....

8. For $a \leq 0$, the roots of the equation $x^2 - 2a|x - a| - 3a^2 = 0$ are ....

1985

9. If a,b,c are in G.P. then the equations $ax^2+2bx+c=0$ and $dx^2+2ex+f=0$ have a common root if d/a, e/b, f/c are in
   1) A.P 2) G.P. 3) H.P. 4) A.G.P

10. If $(5+2\sqrt{6})^{x^2-3}+(5-2\sqrt{6})^{x^2-3}=10$ then x=......

1984

11. The equation $x-\frac{2}{x-1}=1-\frac{2}{x-1}$ has
   1) No root 2) One root
   3) Two roots 4) Infinitely Many roots

12. If the product of the roots of the equation $x^2-3kx+2e^{2\log k}-1=0$ is 7, then roots are real for k=...........

13. If a<b<c<d, then the roots of the equation (x-a) (x-c) +2 (x-b) (x-d)=0 are ....

14. For real x, the function $\frac{(x-a)(x-b)}{x-c}$ will assume real vallues provided
   1) a>b>c 2) a<b<c 3) a>c>b 4) a<c<b

1983

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

16. 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

17. The real values of x which satisfy $x^2-3x+2>0$ and $x^2-3x-4 \leq 0$ are.........

1982

18. If $2+i\sqrt{3}$ is a root of the euqation $x^2+px+q=0$ where p and q are real, then (p,q)=............

19. Number of solutions of the equation $|x|^2-3|x|+2=0$ is........

20. If $e^{\sin x}-e^{-\sin x}-4=0$ then x=...............

1981

21. The solution set of the equation

$$\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 5 \\ 1 & 2x & 5x^2 \end{vmatrix} = 0 \text{ is } \ldots\ldots\ldots\ldots$$

22. The coefficient of x^{99} in the polynomial (x-1) (x-2) (x-3) .....(x-100) is ....

KEY

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

5) -4 or $-1-\sqrt{3}$ 6) $\frac{-1}{4}$ 7) -1

8) $(1-\sqrt{2})a,\ (-1+\sqrt{6})a$ 9) 1

10) $\pm 2, \pm\sqrt{2}$ 11) 1 12) 2

13) real and distinct 14) 3,4 15) 0

16) 3 17) $-1 \leq x < 1$ and $2 < x \leq 4$ 18) (-4, 7) 19) 4 20) has no real values

21) {-1,2} 22) -5050