MATHEMATICS

QUADRATIC EQUATIONS

1. Two numbers differ by 4 and their product is 192. The numbers are

(A) 12, 16 (B) 10, 14

(C) 11, 15 (D) 13, 18

SOL : $x - y = 4 \Rightarrow x - y = \pm 4$

$xy = 192$

If we take $x - y = 4$

then $y = x - 4$

so $x(x - 4) = 192$.

ANS : A

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

(A) (–4, 7) (B) (4, –7)

(C) (4, 7) (D) (–4, –7)

SOL : Since $2 + i\sqrt{3}$ is a root, therefore $2 - i\sqrt{3}$ will be other root. Now sum of the roots = 4 = –p and product of roots = 7 = q. Hence (p, q) = (–4, 7).

ANS : A

3. The values of x satisfying the equation is $\frac{x-1}{x-2} + \frac{x-3}{x-4} = 3\frac{1}{3};\ x \neq 2,4$

(A) $3, \frac{3}{2}$ (B) $5, \frac{5}{2}$

(C) $7, \frac{7}{2}$ (D) $9, \frac{9}{2}$

SOL : $\frac{x-1}{x-2} + \frac{x-3}{x-4} = \frac{10}{3}$

$$\frac{(x-1)^2(x-4) + (x-3)(x-2)}{(x-2)(x-4)} = \frac{10}{3}$$

$$\frac{x^2-5x+4+x^2-5x+6}{x^2-6x+8}=\frac{10}{3}$$

$3(2x^2 - 10x + 10) = 101x^2 - 6x + 8)$

$4x^2 - 15x + 25 = 0$

$2x^2 - 10x - 5x + 25 = 0$

$2x^2 - 10x - 5x + 25 = 0$

$2x(x - 5) - 5(x - 5) = 0$

$(x - 5)(2x - 5) = 0$

$x = 5, 5/2.$

ANS : B

4. Which of the following equations has imaginary roots :

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

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

SOL : $x^2 + x + 1$

$D = (1)^2 - 4 \times 1 \times 1$

$= -3$ $D < 0$ then the roots are imaginary.

ANS : D

5. If –4 is a root of the quadratic equation $x^2 + px - 4 = 0$ and the quadratic equation $x^2 + px + k = 0$ has equal roots, the value of k is

(A) $\frac{3}{4}$ (B) $\frac{5}{4}$

(C) $\frac{7}{4}$ (D) $\frac{9}{4}$

SOL : Since –4 is a root of the equation $x^2 + px - 4 = 0$

$\therefore$ $(-4)^2 + p \times (-4) - 4 = 0$ [$\because$ A root always satisfies the equation]

$\Rightarrow$ $16 - 4p - 4 = 0$

$\Rightarrow$ $4p = 12 \;\; p = 3$

The equation $x^2 + px + k = 0$ has equal roots

$\therefore$ Discriminant = 0

$\Rightarrow$ $p^2 - 4k = 0$ [$\because$ a = 1, b = p and c = k]

$\Rightarrow$ $9 - 4k = 0$ [$\because$ p = 3]

$\Rightarrow$ $k = 9/4$.

ANS : D

6. The values of k for which the equation $x^2 - 4x + k = 0$ has distinct real roots is

(A) $k < 4$ (B) $k > 4$

(C) $k = 4$ (D) k is undefined

SOL : The given equation is $x^2 - 4x + k = 0$

Here, $a = 1, b = -4$ and $c = k$

$\therefore$ $D = (-4)^2 - 4 \times 1 \times k = 16 - 4k$

The given equation will have real and distinct roots, if

$D > 0 \Rightarrow 16 - 4k > 0 \Rightarrow 16 > 4k \Rightarrow 4k < 16 \Rightarrow k < 16/4 = 4$

Hence, the given equation will have distinct roots, if $k < 4$.

ANS : A

7. A two digit number is four times the sum and three times the product of its digits. The number is

(A) 22 (B) 23

(C) 24 (D) 25

SOL : Let the digits at tens and units place of the number be x and y respectively. Then,

Number = $10x + y$

It is given that

Number = 4 × Sum of the digits. Also, Number = 3 × Product of digits

$\Rightarrow$ $10x + y = 4(x + y)$ and $10x + y = 3xy$

$\Rightarrow$ $6x - 3y = 0$ and $10x + y = 3xy$

$\Rightarrow$ $y = 2x$ and $10x + y = 3xy$

$\Rightarrow$ $10x + 2x = 3x \times 2x$ [On eliminating y]

$\Rightarrow$ $6x^2 - 12x = 0$ $6x(x - 2) = 0$

$\Rightarrow$ $x = 0$, or $x = 2$

Since the given number is a two digit number. So, its tens digit cannot be zero.

$\therefore$ $x = 2$

$\Rightarrow$ $y = 2 \times 2 = 4$ [$\because$ $y = 2x$]

Hence, required number = $10x + y = 10 \times 2 + 4 = 24$.

ANS : B

8. One year ago, a man was 8 times as old as his son. Now his age is equal to the square of his son's age. their present ages are

(A) 7 years, 49 years (B) 8 years, 48 years

(C) 9 years, 50 years (D) 10 years, 51 years

SOL : Suppose, one year ago, son's age be x years.

Then, man's age one year ago = 8x years.

$\therefore$ Present age of son = (x + 1) years and, present age of man = (8x + 1) years.

$\therefore$ $8x + 1 = (x + 1)^2$ [Given]

$\Rightarrow$ $x^2 - 6x = 0$

$\Rightarrow$ $x = 0$ or, $x = 6$

$\Rightarrow$ $x = 6$ [$\because$ Son's age cannot be 0)

So, Present age of son = (x + 1) years = 7 years.

and, Present age of man = (8x + 1) years = 49 years.

ANS : A

9. The quadratic equation whose roots are twice the roots of $2x^2 - 5x + 2 = 0$ is

(A) $8x^2 - 10x + 2 = 0$ (B) $x^2 - 5x + 4 = 0$

(C) $2x^2 - 5x + 2 = 0$ (D) $x^2 - 10x + 6 = 0$

ANS : B

10. If $c \neq 0$ and the equation $\frac{p}{2x} = \frac{a}{x+c} + \frac{b}{x-c}$ has two equal roots, then p can be

(A) $\left(\sqrt{a}-\sqrt{b}\right)^2$ (B) $\left(\sqrt{a}+\sqrt{b}\right)^2$

(C) a + b (D) a – b

ANS : We can write the given equation as $\frac{p}{2x} = \frac{(a+b)\ x\ +\ c\ (b-a)}{x^2-c^2}$

or $p(x^2 - c^2) = 2(a + b)x^2 - 2c(a - b)x$

or $(2a + 2b - p)x^2 - 2c(a - b)x + pc^2 = 0$

For this equation to have equal roots

$c^2(a-b)^2 - pc^2(2a + 2b - p) = 0$

$\Rightarrow$ $(a - b)^2 - 2p(a + b) + p^2 = 0$ [$\because$ c^2 0]

$\Rightarrow$ $[p - (a + b)]^2 = (a + b)^2 - (a - b)^2 = 4ab$

$\Rightarrow$ $p - (a + b) = \pm\ 2\sqrt{ab}$

$\Rightarrow$ $p = a + b \pm 2\sqrt{ab} = (\sqrt{a} \pm\sqrt{b})^2$

Hence option (b) is correct.

ANS : B

11. The value of a such that x = 3 is a solution of the equation $ax^2 + 2x + 3 = 0$ is

(A) 0 (B) 1

(C) 2 (D) –1

SOL : If x = 3 is a solution of $ax^2 + 2x + 3 = 0$,

$a(3)^2 + 2(3) + 3 = 0 \Rightarrow 9a + 9 = 0 \Rightarrow a = -1$.

ANS : D

12. Out of a group of swans, 7/2 times the square root of the total number of swans are on the bank of a pond. Two swans are in the water. The total number of swans is?

(A) 16 (B) 17

(C) 18 (D) 19

SOL : Let the total number of swans = x.

Given that 7/2 times the square root of the total number of swans are on the bank.

$\therefore$ number of swans on the bank $= \frac{7}{2}\sqrt{x}$

$\therefore$ $\frac{7}{2}\sqrt{x} + 2 = x \Rightarrow \frac{7}{2}\sqrt{x} = x - 2 \Rightarrow \frac{49}{4}x = x^2 + 4 - 4x$

$\Rightarrow$ $49x = 4x^2 + 16 - 16x \Rightarrow 4x^2 - 65x + 16 = 0$

$\Rightarrow$ $(4x - 1)(x - 16) = 0 \Rightarrow x = \frac{1}{4}$ or $x = 16$

Since x cannot be a fraction, x = 16.

ANS : A

13. The perimeter of a rectangle is 82 m and its area is 400 m^2. The length of its diagonal is

(A) $\sqrt{880}$ (B) $\sqrt{881}$

(C) $\sqrt{882}$ (D) $\sqrt{883}$

SOL : Let the sides of the rectangle be x and y.

Given, perimeter = 82 m $\Rightarrow 2(x + y) = 82 \Rightarrow x + y = 41$

$\Rightarrow y = 41 - x$ .....(i)

Given also, area = 400 m^2 $\Rightarrow xy = 400$ .....(ii)

Substituting the value of y from (i) in (ii),

$x(41 - x) = 400 \Rightarrow 41x - x^2 = 400$

$\Rightarrow$ $x^2 - 41x + 400 = 0 \Rightarrow (x - 25)(x - 16) = 0$

$\Rightarrow$ $x = 25$ or $x = 16$

when x = 25, y = 41 – 25 = 16 when x = 16, y = 41 – 16 = 25

Therefore, the sides of the rectangle are 16 m and 25 m.

$\therefore$ length of its diagonal $= \sqrt{25^2 + 16^2} = \sqrt{625 + 256} = \sqrt{881}$m.

ANS : B

14. If a root of the equation $ax^2 + bx + c = 0$ be reciprocal of a root of the equation $a'x^2 + b'x + c' = 0$ then

(A) $(cc' - aa')^2 = (ba' - cb')(ab' - bc')$ (B) $(bb' - aa')^2 = (ca' - bc')(ab' - bc')$

(C) $(cc - aa')^2 = (ba' + cb')(ab' + bc')$ (D) $(c - c')^2 = (a - a')^2$

SOL : Let α be a root of equation, then $\frac{1}{\alpha}$ be a root of second equation, therefore

$a\alpha^2 + b\alpha + c = 0$

and $a'\frac{1}{\alpha^2} + b'\frac{1}{\alpha} + c' = 0$

or $c'\alpha^2 + b'\alpha + a' = 0$

On solving eqs. (i) and (ii)

$$\frac{\alpha^2}{ba' - b'c} = \frac{\alpha}{cc' - aa'} = \frac{1}{ab' - bc'}$$

$\Rightarrow \quad (cc' - aa')^2 = (ba' - cb')(ab' - bc')$.

ANS : A

15. If $x = \sqrt{1 + \sqrt{1 + \sqrt{1 + ...\infty}}}$, then x is equal to

(A) $\frac{1+\sqrt{5}}{2}$ (B) $\frac{1-\sqrt{5}}{2}$

(C) $\frac{1\pm\sqrt{5}}{2}$ (D) $\frac{1\pm\sqrt{3}}{2}$

SOL : We have, $x = \sqrt{1 + \sqrt{1 + \sqrt{1 + ...\infty}}}$

$\Rightarrow \quad x = \sqrt{1 + x}$

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

$\Rightarrow \qquad x = \frac{1 \pm \sqrt{1+4}}{2} = \frac{1 \pm \sqrt{5}}{2}$

As x > 0 we take only $x = \frac{1+\sqrt{5}}{2}$.

ANS : A

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

(A) 0 (B) 5 (C) $\frac{1}{6}$ (D) 6

ANS : B

17. The roots of the equation $x^2 - x - 3 = 0$ are

(A) Imaginary (B) Rational (C) Irrational (D) None of these

ANS : C

18. The difference between two numbers is 5 different in their squares is 65. The larger number is

(A) 9 (B) 10 (C) 11 (D) 12

ANS : A

19. The sum of ages of a father and son is 45 years. Five years ago, the product of their ages was 4 times the age of the father at that time. The present age of the father is

(A) 30 yrs (B) 31 yrs (C) 36 yrs (D) 41 yrs

ANS : C

20. If one of the roots of the quadratic equation is $2+\sqrt{3}$ then find the quadratic equation.

(A) $x^2 - (2 + \sqrt{3})\, x + 1 = 0$ (B) $x^2 + (2 + \sqrt{3})\, x + 1 = 0$

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

ANS : C

21. Which of the following quadratic expression can be expressed as a product of real linear factors?

(A) $x^2 - 2x + 3$ (B) $3x^2 - \sqrt{2x} - \sqrt{3}$ (C) $\sqrt{2x^2} - \sqrt{5x} + 3$ (D) None of these

Ans : B

22. Two candidates attempt to solve a quadratic equation of the form $x^2 + px + q = 0$. One starts with a wrong value of p and finds the roots to be 2 and 6. The other starts with a wrong value of q and finds the roots to be 2 and – 9. Find the correct roots of the equation :

(A) 3, 4 (B) – 3, – 4 (C) 3, – 4 (D) – 3, 4

Ans : B

23. Solve for x : $15x^2 – 7x – 36 = 0$

(A) $\frac{5}{9},-\frac{4}{3}$ (B) $\frac{9}{5},-\frac{4}{3}$ (C) $\frac{5}{9},-\frac{3}{4}$ (D) None of these

Ans : B

24. Solve for y : $7y^2 - 6y - 13\sqrt{7} = 0$

(A) $\sqrt{7},2\sqrt{7}$ (B) $3,\frac{2}{\sqrt{7}}$ (C) $\frac{13}{\sqrt{7}},-\sqrt{7}$ (D) None of these

Ans : C

25. Solve for x : $6x^2 + 40x = 31$

(A) $\frac{3}{8},\frac{2}{5}$ (B) $\frac{3}{8},\frac{3}{2}$ (C) $0,\frac{8}{3}$ (D) $\frac{8}{3},\frac{5}{2}$

Ans : D

26. Determine k such that the quadratic equation $x^2 + 7 (3 + 2k) – 2x (1 + 3k) = 0$ has equal roots :

(A) 2, 7 (B) 7, 5 (C) $2,-\frac{10}{9}$ (D) None of these

Ans : C

27. Discriminant of the roots of the equation $– 3x^2 + 2x – 8 = 0$ is

(A) – 92 (B) – 29 (C) 39 (D) 49

Ans : A

28. The nature of the roots of the equation $x^2 - 5x + 7 = 0$ is

(A) No real roots (B) 1 real root (C) Can't be determined (D) None of these

Ans : A

29. The roots of $a^2x^2 + abx = b^2$, $a \neq 0$ are :

(A) Equal (B) Non-real (C) Unequal (D) None of these

Ans : C

30. The equation $x^2 - px + q = 0$ $p, q \in R$ has no real roots if :

(A) $p^2 > 4q$ (B) $p^2 < 4q$ (C) $p^2 = 4q$ (D) None of these

Ans : B

31. Determine the value of k for which the quadratic equation $4x^2 - 3kx + 1 = 0$ has equal roots :

(A) $\pm\left[\frac{2}{3}\right]$ (B) $\pm\left[\frac{4}{3}\right]$ (C) ± 4 (D) ± 6

Ans : B

32. Find the value of k such that the sum of the square of the roots of the quadratic equation $x^2 - 8x + k = 0$ is 40 :

(A) 12 (B) 2 (C) 5 (D) 8

Ans : A

33. Find the value of p for which the quadratic equation $x^2 + p(4x + p - 1) + 2 = 0$ has equal roots :

(A) $-1, \frac{2}{3}$ (B) 3, 5 (C) $1, -\frac{4}{3}$ (D) $\frac{4}{3}, 2$

Ans : A

34. The length of a hypotenuse of a right triangle exceeds the length of its base by 2 cm and exceeds twice the length of the altitude by 1 cm. Find the length of each side of the triangle (in cm) :

(A) 6, 8 10 (B) 7, 24, 25 (C) 8, 15, 17 (D) 7, 40, 41

Ans : C

35. A two digit number is such that the product of it's digits is 12. When 9 is added to the number, the digits interchange their places, find the number :

(A) 62 (B) 34 (C) 26 (D) 43

Ans : B

36. A plane left 40 minutes late due to bad weather and in order to reach it's destination, 1600 km away in time, it had to increase it's speed by 400 km/h from it's usual speed. Find the usual speed of the plane :

(A) 600 km/h (B) 750 km/h (C) 800 km/h (D) None of these

Ans : C

37. A shopkeeper buys a number of books for Rs. 80. If he had bought 4 more for the same amount, each book would have cost Re. 1 less. How many books did he buy?

(A) 8 (B) 36 (C) 24 (D) 28

ANS : B

38. The squares have sides x cm and (x + 4) cm. The sum of their areas is 656 cm^2. find the sides of the square.

(A) 8 cm, 12 cm (B) 12 cm, 15 cm (C) 6 cm, 10 cm (D) 16 cm, 20 cm

Ans : D

39. The real values of a for which the quadratic equation $2x^2 – (a^3 + 8a – 1) x + a^2 – 4a = 0$ possesses roots of opposite signs are given by :

(A) $a > 6$ (B) $a > 9$ (C) $0 < a < 4$ (D) $a < 0$

Ans : C

40. The roots of the equation $(x – a) (x – b) (x – c) + (x – b) (x – c) +(x – c) (x – a) = 0$ are :

(A) Real (B) Not real (C) Imaginary (D) Rational

ANS : A

41. The integral values of k for which the equation $(k-2)x^2 + 8x + k + 4 = 0$ has both the roots real, distinct and negative is :

(A) 0 (B) 2 (C) 3 (D) – 4

ANS : C

42. If the roots of the equation $\frac{x^2 - bx}{ac - c} = \frac{m-1}{m+1}$ are equal and of oppositve sign, then the value of m will be :

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

ANS : A

43. If α, β are the roots of the equation $x^2 + 2x + 4 = 0$, then $\frac{1}{\alpha^3}\frac{1}{\beta^3}$ is equal to :

(A) $-\frac{1}{2}$ (B) $\frac{1}{4}$ (C) 32 (D) $\frac{1}{32}$

ANS : B

44. If $x = \sqrt{6 + \sqrt{6 + \sqrt{6 + ...to\infty}}}$, then :

(A) x is an irrational number (B) $2 < x < 3$

(C) $x = 3$ (D) None of these

ANS : C

45. If α, β are the roots of the equation $x^2 + 7x + 12 = 0$, then the equation whose roots are $(\alpha + \beta)^2$ and $(\alpha - \beta)^2$ is :

(A) $x^2 + 50x + 49 = 0$ (B) $x^2 - 50x + 49 = 0$ (C) $x^2 - 50x - 49 = 0$ (D) $x^2 + 12x + 7 = 0$

ANS : B

46. The values of k (k > 0) for which the equation $x^2 + kx + 64 =$ and $x^2 - 8x + k = 0$ both will have real roots is :

(A) 8 (B) 16 (C) – 64 (D) None of these

ANS : B

47. If α, β are the roots of the equation $x^2 + bx - c = 0$, then the equation whose roots are b and c is :

(A) $x^2 + \alpha x - \beta = 0$ (B) $x^2 - [(\alpha + \beta) + \alpha\beta]x - \alpha(\alpha + \beta) = 0$

(C) $x^2 + (\alpha\beta + \alpha + \beta)x + \alpha\beta(\alpha + \beta) = 0$ (D) $x^2 + (\alpha\beta + \alpha + \beta)x - \alpha\beta(\alpha + \beta) = 0$

ANS : C

48. Solve for y : $9y^4 - 29y^2 + 20 = 0$

(A) $\pm 2, \pm\frac{2}{3}$ (B) $\pm 3, \pm\frac{3}{\sqrt{5}}$ (C) $\pm 1, \pm\frac{2\sqrt{5}}{3}$ (D) None of these

ANS : C

49. Solve for x : $x^6 - 26x^3 - 27 = 0$

(A) – 1, 3 (B) 1, 3 (C) 1, – 3 (D) – 1, – 3

ANS : A

50. Solve : $\sqrt{2x+9} + x = 3$:

(A) 4, 16 (B) 8, 20 (C) 2, 8 (D) None of these

ANS : B

51. Solve : $\sqrt{2x+9} - \sqrt{x-4} = 3$

(A) 4, 16 (B) z8, 20 (C) 2, 8 (D) None of these

ANS : B

52. Solve for x : $2\left[x^2 + \frac{1}{x^2}\right] - 9\left[x + \frac{1}{x}\right] + 14 = 0$:

(A) $\frac{1}{2}$, 1, 2 (B) 2, 4, $\frac{1}{3}$ (C) $\frac{1}{3}$, 4, 1 (D) None of these

ANS : A

53. Solve x : $6\left[x^2 + \frac{1}{x^2}\right] - 25\left(x + \frac{1}{x}\right) + 12 = 0$:

(A) $-\frac{1}{3}, -\frac{1}{2}$, 2, 3 (B) $\frac{1}{3}$, $\frac{1}{2}$, 2, 3 (C) $\frac{1}{3}$, $\frac{1}{2}$, – 2 , – 3 (D) None of these

ANS : A

54. Solve for x : $\sqrt{x^2+x-6}-x+2=\sqrt{x^2-7x+10},\ x\in R$:

(A) 2, 6, $-\frac{10}{3}$ (B) 2, 6 (C) – 2 , – 6 (D) None of these

ANS : B

55. Solve for x : $3^{x+2}+3^{-x}=10$

(A) – 3, – 2 (B) – 2, 0 (C)2 , 3 (D) None of these

ANS : B

56. Solve for x : (x + 1) (x + 2) (x + 3) (x + 4) = 24 (x $\in$ R) :

(A) 0, – 5 (B) 0, 5 (C) 0, – 2 (D) 0, 2

ANS : A

57. The sum of all the real roots of the equation $|x-2|^2+|x-2|^2-2=0$ is :

(A) 2 (B) 3 (C) 4 (D) None of these

ANS : C

58. If a, b $\in$ {1, 2, 3, 4}, then the number of quadratic equation of the form ax2 + bx + 1 = 0, having real roots is :

(A) 6 (B) 7 (C) 8 (D) None of these

ANS : B

59. The number of real solutions of $x-\frac{1}{x^2-4}=2-\frac{1}{x^2-4}$ is :

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

ANS : A

60. If $(2+\sqrt{3})^{x^2-2x+1}+(2-\sqrt{3})^{x^2-2x-1}=\frac{2}{2-\sqrt{3}}$, then x is equal to :

(A) 0 (B) 1 (C) 2 (D) Both (A) and (C)

ANS : D

61. The quadratic equation $3x^2 + 2(a^2 + 1)x + a^2 - 3a + 2 = 0$ possesses roots of opposite sign then a lies in :

(A) $(-\infty, 0)$ (B) $(-\infty, 1)$ (C) (1, 2) (D) (4, 9)

ANS : C

62. The equation $\sqrt{x+1} - \sqrt{x-1} = \sqrt{4x-1}$ has :

(A) No solution (B) One solution (C) Two solution (D) More than two solution

ANS : A

63. The number of real solutions of the equation $2|x|^2 - 5|x| + 2 = 0$ is :

(A) 0 (B) 4 (C) 2 (D) None of these

ANS : B

64. The number of real roots of the equation $(x - 1)^2 + (x - 2)^2 + (x - 3)^2 = 0$:

(A) 0 (B) 2 (C) 3 (D) 6

ANS : A

65 . The number of real solutions of the equation $2^{3x^2 - 7x + 4} = 1$ is :

(A) 0 (B) 4 (C) 2 (D) Infinitely many

ANS : C

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

(A) – 2 (B) $-\frac{1}{2}$ (C) $\frac{1}{2}$ (D) 0

ANS : B

67. If $x = \sqrt{2 + \sqrt{2 + \sqrt{2 + ... + \infty}}}$, then x is :

(A) 1 (B) 2 (C) 3 (D) None of these

ANS : B

68. Equation $ax^2 + 2x + 1$ has one double root if :

(A) a = 0 (B) a = – 1 (C) a = 1 (D) a = 2

ANS : C

69. Solve for x : (x + 2) (x – 5) (x – 6) (x + 1) = 144 :

(A) –1, –2, –3 (B) 7, – 3, 2 (C) 2, – 3, 5 (D) None of these

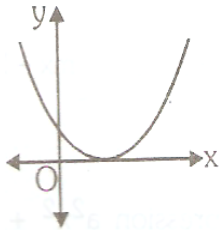
ANS : B

70. If f(x) = $\frac{2x+5}{x^2+x+5}$, then find f(f(– 1))

(A) $\frac{149}{155}$ (B) $\frac{155}{147}$ (C) $\frac{155}{149}$ (D) $\frac{147}{155}$

ANS : C

71. What does the following graph represent?



(A) Quadratic polynomial has just one root.

(B) Quadratic polynomial has equal one roots.

(C) Quadratic polynomial has no root.

(D) Quadratic polynomial has equal roots and constant term is non-zero.

ANS : D

72. Consider a polynomial $ax^2 + bx + c$ such that zero is one of it's roots then :

(A) $c = 0, x = \frac{-b}{a}$ satisfies the polynomial equation

(B) $c \neq 0, x = \frac{-b}{a}$ satisfies the polynomial equation

(C) $, x = \frac{-b}{a}$ satisfies the polynomial equation

(D) Polynomial has equal roots.

ANS : A

73. For a parabola opening upwards and above x-axis, quadratic will have :

(A) Equal roots and a = 0 (B) Unequal roots and $a \neq 0$

(C) No roots, a > 0 (D) No roots, a < 0

ANS : C

74. The equation $\sqrt{x+10} - \frac{6}{\sqrt{x+10}} = 5$ has :

(A) An extraneous root between – 5 and – 1.

(B) An extraneous root between – 10 and – 6.

(C) Two extraneous roots.

(D) A real root between 20 and 25.

ANS : B

75 . Consider a quadratic polynomial $f(x) = ax^2 – x + c$ such that $ac > 1$ and it's graph lies below x-axis then :

(A) a < 0, c > 0 (B) a < 0, c < 0 (C) a > 0, c > 0 (D) a > 0, c < 0

ANS : B

76. If α, β are the roots of a quadratic equation $x^2 – 3x + 5 = 0$, then the equation whose roots are $(\alpha^2 - 3\alpha + 7)$ and $(\beta^2 - 3\beta + 7)$ is :

(A) $x^2 + 4x + 1 = 0$ (B) $x^2 – 4x + 4 = 0$ (C) $x^2 – 4x – 1 = 0$ (D) $x^2 + 2x + 3 = 0$

ANS : B

77. If the expression $\left[mx - 1 + \frac{1}{x} \right]$ is non negative for all positive real x, then the minimum value of m must be :

(A) $\frac{-1}{2}$ (B) 0 (C) $\frac{1}{4}$ (D) $\frac{1}{2}$

ANS : C

78. The expression $a^2x^2 + bx + 1$ will be positive for all $x \in R$ if :

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

ANS : B

79 If x be real, then 3x2 + 14x + 11 > 0 when :

(A) $x < -\frac{3}{2}$ (B) $x > -\frac{3}{4}$ (C) x > – 2 (D) Never

ANS : B

80. For what value of a the curve y = x2 + ax + 25 touches the x-axis :

(A) 0 (B) ± 5 (C) ± 10 (D) None of these

ANS : C

81. The integer k for which the inequality $x^2 – 2(4k – 1) x + 15k2 – 2k – 7 > 0$ is valid for any x is :

(A) 2 (B) 3 (C) 4 (D) 6

ANS : B

82. The value fo the expression $x^2 – 2bx + c$ will be positive for all real x if :

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

ANS : D

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

(A) Positive (B) Non-negative

(C) Negative (D) May be positive, zero or negative

ANS : A

84. The range of $y = \frac{x+2}{2x^2+3x+6}$, if x is real, is :

(A) $-\frac{1}{13} \le y \le \frac{1}{3}$ (B) $\frac{1}{13} \le y \le \frac{1}{3}$ (C) $-\frac{1}{13} \le y \le \frac{1}{13}$ (D) None of these

ANS : A

85. If x $\in$ R and $k = \frac{(x^2 - x + 1)}{(x^2 + x + 1)}$, then :

(A) $x \le 0$ (B) $\frac{1}{3} \le k \le 3$ (C) $k \ge 5$ (D) None of these

ANS : B

86. For all real values of x, the maximum value of the expression $\frac{x}{x^2 - 5x + 9}$ is :

(A) 1 (B) 45 (C) 90 (D) None of these

ANS : A

87. If x be real then the maximum and minimum value of the expression $\frac{x^2-3x+4}{x^2+3x+4}$ are

(A) 2, 1 (B) $7,\frac{1}{7}$ (C) $5,\frac{1}{5}$ (D) None of these

ANS : B

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

(A) $\frac{17}{7}$ (B) $\frac{1}{4}$ (C) 41 (D) None of these

ANS : C

89. The value of k, so that the equation $2x^2 + kx - 5 = 0$ and $x^2 - 3x - 4 = 0$ have one root in common is :

(A) – 2, – 3 (B) $-3,-\frac{27}{7}$ (C) – 5, – 6 (D) None of these

ANS : B

90. If the expression $x^2 - 11x + a$ and $x^2 - 14x + 2a$ must have a common factor and $a \neq 0$, then the common factor is :

(A) (x – 3) (B) (x – 6) (C) (x – 8) (D) None of these

ANS : C

91. The value of m for which one of the roots of $x^2 - 3x + 2m = 0$ is double of one of the roots of $x^2 - x + m = 0$ is :

(A) 0, 2 (B) 0, – 2 (C) 2, – 2 (D) None of these

ANS : B

92. If the equation $x^2 + bx + c = 0$ and $x^2 + cx + b = 0$, ($b \neq c$) have a common root then :

(A) b + c = 0 (B) b + c = 1 (C) b + c + 1 = 0 (D) None of these

ANS : C

93. If both the roots of the equation $k(6x^2 + 3) + rx + 2x^2 - 1 = 0$ and

$6k(2x^2 + 1) + px + 4x^2 - 2 = 0$ are common, then 2r – p is equal to :

(A) 1 (B) – 1 (C) 2 (D) 0

ANS : D

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

(A) 2 (p + q + r) (B) p + q + r (C) – (p + q + r) (D) pqr

ANS : B

95. If $x^2 – ax – 21 = 0$ and $x^2 – 3ax + 35 = 0$; $a > 0$ have a common root, then a is equal to :

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

ANS : C

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

(A) $\frac{1}{2}, \frac{2}{9}$ (B) $0, \frac{1}{2}$ (C) $\frac{2}{9}$ (D) $0, \frac{1}{2}, \frac{2}{9}$

ANS : C

97. If the quadratic equation $2x^2 + ax + b = 0$ and $2x^2 + bx + a = 0$ ($a \neq 0$) and $ax^2 – x + 1 = 0$ have a common root, the value of a + b is :

(A) – 3 (B) – 2 (C) – 1 (D) 0

ANS : B

98. If the equation $x^2 + bx + ca = 0$ and $x^2 + cx + ab = 0$ have a common root and $b \neq c$, then their other roots will satisfy the equation :

(A) $x^2 – (b + c) x + bc = 0$ (B) $x^2 – ax + bc = 0$

(C) $x^2 + ax + bc = 0$ (D) None of these

ANS : A

99. If both the roots of the equation $x^2 + mx + 1 = 0$ and $(b – c)x^2 + (c – a) x + (a – b) = 0$ are common then :

(A) m = – 2 (B) m = – 1 (C) m = 0 (D) m = 1

ANS : A

100. The quadratic equation $x^2 - 6x + a = 0$ and $x^2 - cx + ab = 0$ have one common root. The other roots of first and second equation are integers in the ratio 4 : 3. Then common root is :

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

ANS : D