SECTION - I
Straight Objective Type

1. $\frac{x-2}{x-1}=\frac{1-2}{x-2}$

$x-1\neq 0$ but x $=1$

$\Rightarrow$ above equations has no roots

Hence (a) is the correct option.

2. $\left|x^2\right|-3|x|+2=0$

x^2 is always positive

$\Rightarrow \quad \left|x^2\right|=x^2$

$|x|=x$ for $x>0$

$=x$ for x > 0

If $x>0 \Rightarrow \left|x^2\right|-3|x|+2=0$

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

$\Rightarrow (x-1)(x-2)=0 \Rightarrow x=1$ or 2

If $x<0 \Rightarrow \left|x^2\right|-3|x|+2=0$

is $x^2-3(-x)+2=0$

$\Rightarrow \quad x^2+3x+2=0$

$\Rightarrow \quad (x+1)(x+2)=0$

$\Rightarrow x=-1$ or -2

$x=\{1,2,-1,-2\}$

Hence (a) is the correct option.

3. $(x-a)(x-b)=abx^2$

$\Rightarrow \quad x^2-(a+b)x+ab=abx^2$

$\Rightarrow (1-ab)x^2-(a+b)x+ab=0$

$$\Delta \quad = b^2 - 4ac$$

$$= (a+b)^2 - 4(1-ab)(ab)$$

$$= a^2 + b^2 - 2ab - 4(ab - a^2b^2)$$

$$= a^2 + b^2 - 2ab - 4ab + 4ab + 4a^2b^2$$

$$= a^2 + b^2 + 4a^2b^2 - 6ab \geq 0$$

$\Rightarrow$ The roots are real

$\Rightarrow$ Hence (a) is the correct option.

4. $(b-c)x^2 + (c-a)x + (a-b) = 0$

$b - c + c - a - b = 0$

$\Rightarrow$ Discriminant of the above equation is zero.

$\Rightarrow$ The above equation has equal roots

Hence (a) is the correct option.

5. $$\frac{(x+2)(x-5)}{(x-3)(x+6)} = \frac{x-2}{x+4}$$

$$\frac{x^2 - 3x - 10}{x^2 + 3x - 18} = \frac{x-2}{x-4}$$

$\Rightarrow (x-2)(x^2+3x-18) \; -(x^2\,3x-10)(x-4) = 0$

is a linear equation in the first degree

$\Rightarrow$ The number of roots of the equation is 1.

Hence (c) is the correct option.

6. $7(q-r)x^2 + (r-p)x + (p-q) = 0$

The sum of the coefficients of all terms is equal to zero

Since $q - r + r - p + p - g = 0$

$\Rightarrow$ 1 is one of its root

Let α is another root

$$1 + \alpha = \frac{(r-p)}{q-r} or \alpha - \frac{p-q}{q-r}$$

$\Rightarrow \frac{p-q}{q-r}$,1 are the roots of the above equation

Hence (b) is the correct option.

7. The expression $ax^2+bx+c, a>0$ is positive for all real value of x only if $b^2-4ac<0$

Hence (c) is the correct option.

8. $(x-b)(x-c)+(x-c)(x-a)$

$+(x-a)(x-b)=0$

$\Rightarrow 3x^2-2x(a+b+c)$

$+(ab+bc+ac)=0$

The roots of the above equation is always negative.

Hence (b) is the correct option.

9. The sum of the roots of a Quadratic equation $ax^2+bx+c=0$ is $-\frac{b}{a}$

$\Rightarrow$ For the equation

$(M+1)x^2+2mx+3=0$

Sum of the roots $= \frac{-2m}{m+1}=1$

$$\Rightarrow \quad -2m=m+1$$

$$-3m=1$$

$$m=-\frac{1}{3}$$

Hence (d) is the correct option.

10. The roots of the equation

$2^{2x}-10.2^x+16=0$

Let $2^x=a$

$$a^2 - 10a + 16 = 0$$
$$(a-8)(a-2) = 0$$
$$A = 8$$
$$2^x = 8$$
$$2^x = 2^3$$
$$x = 3$$
$$a = 2$$
$$2^x = 2^1$$
$$x = 1$$
$\Rightarrow \quad x = 1 \text{ or } 3$

The roots of the equation are 1, 3

Hence (b) is the correct option.

11. $x^2 = px + 1$ is a factor of $ax^3 + bx + c$ then when $ax^3 + bx + c$ is divided by $x^2 px + 1$, it leaves the remainder '0'

$$x^2 + px + 1 \left| \begin{array}{l} ax^3 + bx + c \\ \underline{ax^3 + a\,p\,x^2 + a\,x} \end{array} \right| a\,x$$

$$-a\,p\,x^2 + (b-a)\,x + c = 0$$
$$a^2 - c^2 = -ab.$$

Hence (b) is the correct option.

12. $\dfrac{a}{x-a} + \dfrac{b}{x-b} = 1$

$$a(x-b) + b(x-a) = (x-a)(x-b)$$
$\Rightarrow \quad ax - ab + bx - ab$
$$= x^2 - (a+b)\,x + ab$$
$\Rightarrow \quad x^2 - 2(a+b)\,x + 3ab = 0$

The roots are equal and in opposite sign

Let α , $-\alpha$ are the roots

$$(\alpha)+(-\alpha)=\frac{+2(a+b)}{1}$$

$\Rightarrow \quad a+b=0$

Hence (b) is the correct option.

13. If a > b then the equation

$x^2+(a+b)x+ab<0$

$(x+a)(x+b)<0$

$(x-(-a))(x-(-b))<0$

$\Rightarrow \quad -b<x<-a \qquad (\because a>b)$

Hence (c) is the correct option.

14. $x=\sqrt{6+\sqrt{6+\sqrt{6+\sqrt{6+}}}}.......\alpha$

$x=\sqrt{6+x}$

$x^2=6+x$

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

$\Rightarrow (x-3)(x+2)=0$

$\Rightarrow x=3$

Hence (c) is the correct option.

15. If $2.x^{\frac{1}{3}}+2.x^{-\frac{1}{3}}=5$

Let $x^{-\frac{1}{3}}=a$

$\Rightarrow \quad 2a+\frac{2}{a}=5$

$\Rightarrow 2a^2+2=5a$

$\Rightarrow 2a^2-5a+2=0$

$\Rightarrow (2a-1)(a-2)=0$

$a=\frac{1}{2} or a=2$

$x^{\frac{1}{3}} = 2 \Rightarrow x = 2^3 = 8$

$x^{\frac{1}{3}} = 2^{-1} \Rightarrow x = 2^{-3} = \frac{1}{8}$

Hence (c) is the correct option.

16. α, β are the roots of the equation

$ax^2 + bx + b = 0$

$\Rightarrow \quad \alpha + \beta = -\frac{b}{a}$

$\alpha\beta = -\frac{b}{a}$

$\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} + \sqrt{\frac{b}{a}}$

$\frac{\alpha + \beta}{\sqrt{\alpha\beta}} + \sqrt{\frac{b}{a}}$

$\frac{-\frac{b}{a}}{\sqrt{\frac{b}{a}}} + \sqrt{\frac{b}{a}}$

$= -\sqrt{\frac{b}{a}} + \sqrt{\frac{b}{a}}$

$= 0$

Hence (a) is the correct option.

17. $|x-1| + |x-2| + |x-3| \geq 6$ then

Let $x < 1$

$\Rightarrow \quad -(x-1) - (x-2) - (x-3) \geq 6$

$-3x + 6 \geq 6$

$-3x \geq 0$

$x \leq 0$

$x \le 0$ is one of its solutions.

Let $1 \le x < 2$

$-(x-1)-(x-2)-(x-3) \ge 6$

$x-1-x+2-x+3 \ge 6$

$-x+4 \ge 6$

$-x \ge 2$

$x \le -2$

$x \le -2 \notin 1 \le x < 2$

Let $2 \le x < 3$

$-(\mathrm{x}-1)+(\mathrm{x}-2)-(\mathrm{x}-3) \ge 6$

$2x-4-x+3 \ge 6$

$x-1 \ge 6$

$x \ge 7$

$x \ge 7 \ \notin \ 2 \le x < 3$

Let $x \ge 3$

$x-1+x-2+x-3 \ge 6$

$3x-6 \ge 6$

$3x \ge 12$

$x \ge 4$

$x \ge 4 \ \in \ x \ge 3$

$\Rightarrow x \ge 3$ is another solution.

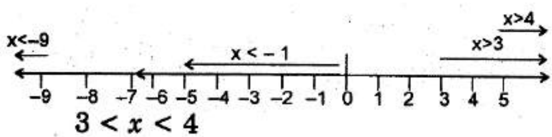
Hence (c) is the correct option.

18. $x^2+6x-27>0$ and $x^2-3x-4<0$

$(\mathrm{x}+9)(\mathrm{x}-3)>0$ and $(\mathrm{x}-4)(\mathrm{x}+1)<0$

$[\mathrm{x}-(-9)[\mathrm{x}-3]>0]$ and $(\mathrm{x}-4)(\mathrm{x}-(-1))<0$

$\Rightarrow x<-9, x>3$ and $x>4$ and $x \ge -1$



Hence (c) is the correct option.

19. $x^2-1<0$ and $x^2-x-2\geq 0$

$x^2-1<0 \quad \Rightarrow -1<x<1$

$x^2-x-2\geq 0 \quad \Rightarrow (x-2)(x+1)\geq 0$

$\Rightarrow x\leq -1$ and $x\geq 2$

$x=\{-1\}$

Hence (d) is the correct option.

20. The quadric equation

$\equiv x^2+19x+60=0$

This the roots are – 15 and – 4

but correct equation

$\equiv x^2+16x+60=0$

$\Rightarrow (x+10)(x+6)=0 \Rightarrow -10,-6$ are the roots

Hence (b) is the correct option.

21. $x^2-ax+b=0$ and $x^2+ax-b=0$ have common root. Let a is the common root.

$\Rightarrow \ \alpha^2-a\alpha+b=0$

and

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

$\Rightarrow \quad \alpha^2-a\alpha+b=\alpha^2+b\alpha-a$

$\Rightarrow \quad a+b=(a+b)\alpha$

$\Rightarrow \alpha=1$ and $a+b=0$

Hence (b) is the correct option.

22. Let α is the common root for the Quadratic creation $ax^2+2cx+b=0$ and $ax^2-2bx+c=0(b\neq c)$

$a\alpha^2+2c\alpha+b=0$ and $a\alpha^3+2b\alpha+c=0$

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

$\Rightarrow (2c-2b)\alpha=c-b$

$$\Rightarrow \quad 2(c-b)\alpha = c-b$$

$$\Rightarrow \quad \alpha = \frac{1}{2}\ c = b$$

$$\alpha = \frac{1}{2} \Rightarrow \alpha = \left(\frac{1}{2}\right)^2 + 2c\left(\frac{1}{2}\right) + b = 0$$

$$\Rightarrow \quad \frac{a}{4} + c + b = 0$$

$$\Rightarrow \quad a + 4b + 4c = 0$$

Hence (c) is the correct option.

23. If the roots of $ax^2 + bx + c = 0 a > 0$ be greater than unity then $a + b + c < 0$

Hence (c) is the correct option.

24. The Number of real roots of the equation

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

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

and $x - 3 = 0$

i.e., x = 1, 2, 3

Hence (d) is the correct option.

25. The ratio of the roots of the equation

$x^2 + bx + c = 0$ is the same as that of

$x^2 + qx + r = 0$ then

$b^2 r = q^2 c$

Hence (d) is the correct option.

26. $(x+1)(x+2)(x+3)(x+4) = 120$

$\Rightarrow (x+1)(x+2)(x+3)(x+4)$

$= (1+1)(1+2)(1+3)(1+4) = 120$

$\Rightarrow x = 1$

Hence (c) is the correct option.

27. $\left|3+\frac{1}{x}\right|=2$

$3+\frac{1}{x}=2 \text{ or} 3+\frac{1}{x}=-2$

$\frac{1}{x}=-1 \text{ or } \frac{1}{x}=-5$

$x=-1 \text{ or } x=-\frac{1}{5}$

$x=-1,\ -\frac{1}{5}$

Hence (c) is the correct option.

28. If $f(\mathrm{x})=2\mathrm{x}^3+mx^2-13x+n$

2, is root of $f(\mathrm{x})= \Rightarrow f(2)=0$

$\Rightarrow \quad 2(2)^3+m(2)^2-13(2)+\mathrm{n}=0$

$\Rightarrow \quad 16+4m-26+n=0$

$\Rightarrow \quad 4m+n=10$

is a root of $f(\mathrm{x})= \Rightarrow \mathrm{f}(3)=0$

$\Rightarrow \quad 2\left(3^3\right)+m\left(3^2\right)-13(3)+\mathrm{n}=0$

$\Rightarrow \quad 54+9m-39+n=0$

$\Rightarrow \quad 9m-15+n=0$

$9m+m=15$

$9m+m=15$

$\underline{4m+n=10}$

$5m \quad = 5$

$m=1 \Rightarrow n=6$

Hence (c) is the correct option.

29. $x^2-(2+m)x+\left(m^2-4m+4\right)$ has coincident roots

$\Rightarrow \; m=0 \text{and} \mathrm{m}=2$

Since $\Rightarrow \quad \dfrac{m^2-4m+4}{1}$

$=(\mathrm{m}-2)^2$

Hence (b) is the correct option.

30. Let $\alpha, 3\alpha$ are the roots of the equation

$(x-1)(7-x)=m$

$\Rightarrow \quad x^2-8x+7=-m$

$\Rightarrow \alpha+3\alpha=8 \qquad \Rightarrow 4\alpha=8$

$3\alpha^2=\dfrac{7+n}{1} \Rightarrow 4\alpha=8$

$\Rightarrow \quad \alpha^2=\dfrac{7+m}{3}$

$\Rightarrow \quad 4=\dfrac{7+m}{3} \quad \Rightarrow m=5$

Hence (d) is the correct option.

SECTION - II

Assertion - Reason Questions

31. $4x^2-8x+3=0$

$4x^2-2x-6x+3=0$

$2x(2\mathrm{x}-1)-3(2\mathrm{x}-1)=0$

$\Rightarrow \quad (2\mathrm{x}-3)-3(2\mathrm{x}-1)=0$

$\Rightarrow \quad x=\dfrac{1}{2} \text{or} \dfrac{3}{2}$

$\Rightarrow$ The roots of the equation are

$\dfrac{1}{2} \text{or} \dfrac{3}{2}$

Since The roots of an Quadratic equation

$ax^2+bx+c=0$ is $\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$

Hence (a) is the correct option.

32. The sum of the roots of are Quadratic equation $ax^2+bx+c=0$ is $\dfrac{-b}{a}$ and the product of the roots = $\dfrac{c}{a}$

$\Rightarrow$ The product of the roots of $9x^2+4x-11=0$ is $\dfrac{-11}{9}$

Hence (a) is the correct option.

33. If 2 is one of the root of $x^2-5x+k=0$

$\Rightarrow$ $2^2-5(2)+\mathrm{k}=0 \Rightarrow 4-10+\mathrm{k}=0$

$\Rightarrow k=6$

Δ is called discriminant of

$ax^2+bx+c=0$ where $\Delta=b^2-4ac$

$b^2-4ac=0\Rightarrow$ The roots are real and equal

$b^2-4ac>0\Rightarrow$ The roots are real and unequal

$b^2-4ac<0\Rightarrow$ The roots are imaginary

Hence (b) is the correct option.

34. $px^2+qxx+r=0$

Let $\alpha,3\alpha$ are the roots of

$px^2+qx+r=0$

$\Rightarrow$ $\alpha+3\alpha=\dfrac{q}{p},\alpha.3\alpha=\dfrac{r}{p}$

$\alpha=\dfrac{q}{p},3\alpha^2=\dfrac{r}{p}$

$$\alpha = \frac{q}{4p}, \alpha^2 \frac{r}{3p}$$

$\Rightarrow$ $$\frac{q^2}{16p^2} = \frac{r}{3p}$$

$\Rightarrow$ $$3q^2 = 16pr$$

The Quadratic equation with roots

α, β is $x^2 - (\alpha + \beta)\mathrm{x} + \alpha\beta$

Hence (b) is the correct option.

35. $x^2 + x + 1 = 0$

$\Delta = (1)^2 - 4(1)(1) = -3 < 0$

If the discriminant $\Delta < 0$

The equation $x^2 + x + 1 = 0$ has no real roots

$ax^2 + bx + c = 0$ has two real roots then $\Delta > 0$

Hence (b) is the correct option.

36. If $3x^2 - 7x + 6 = a(\mathrm{x} - 2)^2 + b(\mathrm{x} - 2) + \mathrm{c}$

$a + b + c = ?$

$3x^2 - 7x + 6$

$= a\left(x^2 - 4x + 4\right)^2 + b(\mathrm{x} - 2) + \mathrm{c}$

$3x^2 - 7x + 6 = a\left(x^2\right)$

$+ x\left(-4a + b\right) + 4a - 2b + c$

$\Rightarrow a = 3, -4a + b = -7$

$-12 + b = -7$

$b = 5$

$4a - 2b + c = 6$

$12 - 10 + c = 6$

$c = 4$

$a + b + c = 3 + 5 + 4 = 12$

The roots of $x^4 - kx^3 + kn^2 + \ln + m = 0$ are am vm cm d. The minimum value of $a^2 + b^2 + c^2 + d^2 = -1$
Hence (b) is the correct option.

37. $|x-2| + |x-3| = 7$

$(x-2) + (x-3) = 7$

$2x - 5 = 7$

$x = 6$

$-(x-2) - (x-3) = 7$

$-2x = 4$

$x = -1$

$x = -1, 6$

$x^2 + ax + b = 0$ and $x^2 + bx + a = 0$

$(a \neq b)$ have a common root than $a + b = -1$

Hence (b) is the correct option.

38. $e^{\sin x} - e^{-\sin x} - 4 = 0$ has no real roots

If the discriminant of $ax^2 + bx + c = 0$ is negative then it has no real roots
Hence (b) is the correct option.

39. The roots of $x^2 + 5|x| + 4 = 0$ are not real

$\sqrt{x+1} - \sqrt{x-1} = \sqrt{4x-1}$ has no solutions
Hence (b) is the correct option.

40. $x^2 - 7x + 2m = 0, x^2 - 11x + 4m = 0$

have a common root
Let α is the common root

$\alpha^2 - 7\alpha + 2m = 0$ and $\alpha^2 - 11\alpha + 4m = 0$

$\alpha^2 - 7\alpha + 2m = \alpha^2 - 11\alpha + 4m$

$\Rightarrow \quad 4\alpha = 2m$

$m = 2\alpha \quad m = 6$

The Number of real solutions of the equations

$(x+4)^3 + (x+3)^3 + (x+2)^3 + (x+1)^2 + (x-5)^3 + 180 = 0$ is one

Hence (b) is the correct option.

SECTION - III
Linked Comprehension Type

41. If one root of the equation $(l-m)x^2 + lx + 1 = 0$ is double other

i.e. $\alpha + 2\alpha = \dfrac{l}{l-m}$ and $\alpha \cdot 2\alpha = \dfrac{l}{l-m}$

$3\alpha = \dfrac{l}{l-m}$ $\qquad$ $2\alpha^2 = \dfrac{l}{l-m}$

$\alpha = \dfrac{l}{3(l-m)}$ $\qquad$ $\alpha^2 = \dfrac{l}{1-n}$

$$\frac{l^2}{9(1-m)^2} = \frac{1}{l-m}$$

$$\frac{l^2}{9(1-m)^2} = 1 \Rightarrow l^2 - 9l + 9m = 0$$

$\Rightarrow$ greatest value of $m = \dfrac{9}{8}$

Hence (b) is the correct option.

42. $ax^2 + bx + c = 0$ and $x^2 + x + 1 = 0$ have a common root then $a + b + c = 0$.

Hence (b) is the correct option.

43. $x^2 = 11x + k = 0$ and $x^2 - 14x + 2k = 0$ have a common root say α

$\alpha^2 - 11\alpha + k = \alpha^2 - 14\alpha + 2k$

$\Rightarrow \quad 3\alpha = k$

$\alpha^2 - 11\alpha + 3\alpha = 0$

$\Rightarrow \qquad \alpha^2 - 8\alpha = 0$

$\Rightarrow \qquad \alpha(\alpha - 8) = 0$

$\Rightarrow \qquad \alpha = 0$

$\Rightarrow \qquad k = 3 \times 8 = 24$

Hence (c) is the correct option.

44. $x^2 + 2(\text{k}-1)\text{x} + \text{k} + 5 = 0$ have positive root

$\Rightarrow \quad 4(\text{k}-1)^2 - 4(1)(\text{k}+5) = 0$

$\Rightarrow \quad k \in (-\alpha, -1)$

Hence (a) is the correct option.

45. $(\text{a}-\text{b})^2 x^2 + 2(\text{a}+\text{b}-2\text{c})\text{x} + 1 = 0$

$\Delta = 4(\text{a}+\text{b}-2\text{c}) - 4(\text{a}-\text{b})^2.1$

< 0

$\Delta < 0 \Rightarrow$ The roots are imaginary.

Hence (c) is the correct option.

46. $ax + by = 1$

$cx^2 + by^2 = 1$ have only one solution

$\Rightarrow \quad x = \dfrac{a}{c}$

Hence (a) is the correct option.

47. $(\text{x}-2)(\text{x}-5) > 0$

$\Rightarrow x < 2$ and $x > 5$

Hence (a) is the correct option.

48. $(x-2)(x-5) > 0$

$\Rightarrow 2 < x < 5$

Hence (b) is the correct option.

49. $(x+2)(x-5)>0$

i.e. $[x-(-2)][x-5]>0$

$\Rightarrow$ $x<-2$ and $x>5$

Hence (c) is the correct option.

50. $2x+3y+5=0, 6x+9y+15=0$

$\frac{2}{3}=\frac{6}{9}\neq\frac{5}{15}$

$\Rightarrow$ Number of solutions is zero

Hence (c) is the correct option.

51. $2r+3y+5=0$ and $2x+3y-7=0$

$\frac{2}{2}=\frac{3}{3}\neq\frac{5}{7}$

Hence (c) is the correct option.

52. $2x+3y+5=0$ and $3x+2y+7=0$

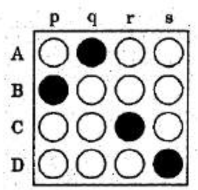
$\frac{2}{3}\neq\frac{3}{2}\neq\frac{5}{7}$

$\Rightarrow$ Number of solution is 1

Hence (a) is the correct option.

SECTION - IV
Matrix - Match Type

53.



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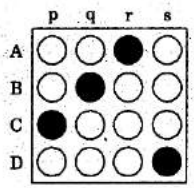

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