ACE OF PACE

ENGINEERING **Grade X moving to XI** **DATE: 25/01/2026**

Section – A

1. (B)

Put $x=-1-2y+4z$ in $-x+5y+z=5$ and $2x-3y-z=-2$

Then solve two equations for y and z.

We get, $y = 1$ and $z = 1$

$\therefore \quad x = 1$

$\therefore \quad (\alpha, \beta, \gamma) = (1, 1, 1)$

2. (C)

$x^2+7x+3=(x-\alpha)(x-\beta)$

$\therefore \quad \alpha+\beta=-7$ and $\alpha\beta=3$

$$\frac{1}{\alpha^3}+\frac{1}{\beta^3}=\frac{\alpha^3+\beta^3}{(\alpha\beta)^3}=\frac{(\alpha+\beta)^3-3\alpha\beta(\alpha+\beta)}{(\alpha\beta)^3}=\frac{(-7)^3-3\times3(-7)}{3^3}=\frac{-280}{27}$$

3. (A)

Clearly $\alpha=2-\sqrt{3}$ and $\beta=1+\sqrt{3}$

$\therefore$ $\alpha+\beta=3$ and $\alpha\beta=\sqrt{3}-1$

$\therefore$ Required equation: $x^2-3x+\sqrt{3}-1=0$

4. (D)

$P(x)=(x^2-16)Q(x)+ax+b$

By remainder theorem,

$P(4)=3$ and $P(-4)=7$

$\therefore$ $4a+b=3$ and $-4a+b=7$

$\therefore$ $a=-\frac{1}{2}$ and $b=5$

$\therefore$ Remainder $=-\frac{x}{2}+5$

5. (B)

For real and equal roots, $D = 0$.

i.e. $b^2=4ac$

$\therefore \quad (-2k)^2=4(k)(3)$

$\therefore \quad k^2-3k=0$

$\therefore \quad k=0, 3$

6. (D)

Let $2x+3y=\frac{1}{u}$ and $3x-y=\frac{1}{v}$.

$\therefore\ 13u+6v=3$ and $39u-12v=-1$

On solving, we get, $u=\frac{1}{13}$ and $v=\frac{1}{3}$.

$\therefore\ 2x+3y=13$ and $3x-y=3$

On solving, we get $x = 2$ and $y = 3$.

$\therefore\ (\alpha,\beta)=(2,3)$

$\therefore\ \alpha+\beta=5$

7. (A)

Let $P(x)=2x^3-4x^2+x+3$

By remainder theorem,

$$\text{Remainder}=P\left(\frac{-1}{2}\right)$$

$$=2\left(-\frac{1}{2}\right)^3-4\times\left(-\frac{1}{2}\right)^2-\frac{1}{2}+3$$

$$=-\frac{1}{4}-1-\frac{1}{2}+3$$

$$=\frac{5}{4}$$

8. (C)

Let α,β and γ are roots of given polynomial.

$\therefore\ 2x^3+3x^2-5x-6=k(x-\alpha)(x-\beta)(x-\gamma)$

$\therefore\ 2x^3+3x^2-5x-6=kx^3-k(\alpha+\beta+\gamma)x^2+k(\alpha\beta+\beta\gamma+\gamma\alpha)x-k\alpha\beta\gamma$

$\therefore\ k=2$ and $k\alpha\beta\gamma=6$

$\therefore\ \alpha\beta\gamma=3$

$\therefore$ Given that product of two zeros (say α and β) is 3.

i.e., $\alpha\beta=3$

$\therefore\ \gamma=1$.

9. (D)

$f(x)$ intersect x-axis four times.

10. (A)

For no solution,

$\frac{2}{k}=\frac{3}{4}\neq\frac{5}{7}$

$\therefore\ k=\frac{8}{3}$

11. (C)

$$\begin{array}{r|l} & x^2+2x+3 \\ \hline x^2+5 & x^4+2x^3+8x^2+12x+18 \\ & \underline{-x^4 \pm 5x^2} \\ & 2x^3+3x^2 \\ & \underline{-2x^3 \pm 10x} \\ & 3x^2+2x \\ & \underline{-3x^2 \pm 15} \\ & 2x+3 \end{array}$$

$\therefore\ p=2$ and $q=3$

12. (B)

$x^2-8x+k=(x-\alpha)(x-\beta)$

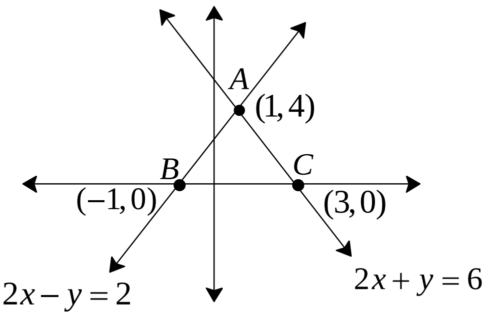
$\therefore \alpha+\beta=8$ and $\alpha\beta=k$

$\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta=40$

$\therefore\ 2\alpha\beta=8^2-40=24$

$\therefore\ \alpha\beta=12$

13. (D)



Area of $\Delta ABC=\frac{1}{2}\times4\times4=8$ sq. units

14. (D)

Theoretical

15. (A)

$|5x+7|=\frac{3}{2}$

$\Rightarrow\ 5x+7=\frac{3}{2}$ or $5x+7=-\frac{3}{2}$

$\Rightarrow\ x=-\frac{11}{10}$ or $x=-\frac{17}{10}$

$\Rightarrow\ -\frac{11}{10}+\left(-\frac{17}{10}\right)=-\frac{28}{10}=-\frac{14}{5}$

16. (C)

Let $2^x=t$

$\therefore\ t^2-10t+16=0$

$\therefore\ (t-8)(t-2)=0$

$\therefore\ t=8$ and $t=2$

$\therefore\ 2^x=8$ and $2^x=2$

$\therefore\ x=3$ and $x=1$

$\therefore$ Product of roots = 3 × 1 = 3

17. (A)

$x=2y-9$

$\therefore\ y^2=4(2y-9)+2$

$\therefore\ y^2-8y+34=0$

$D=(-8)^2-4\times34=64-136<0$

No real value of y.

$\therefore$ Given equations doesn't intersect.

18. (B)

Let α be one root of given equation.

$\therefore\ \dfrac{1}{\alpha}$ is other root

$\therefore\ 2x^2-4x+9k=a(x-\alpha)\left(x-\dfrac{1}{\alpha}\right)$

$\therefore\ a=2$ and $9k=a$

$\therefore\ k=\dfrac{2}{9}$

19. (A)

Let $P(x)=x^2+ax+3$ and $q(x)=x^3+bx^2+x+1$.

By remainder theorem and given condition,

$P(-1)=q(-1)$.

$\therefore\ (-1)^2+a(-1)+3=(-1)^3+b(-1)^2+(-1)+1$

$\therefore\ 1-a+3=-1+b-1+1$

$\therefore\ a+b=5$

20. (D)

$x^2-18x+77=(x-7)(x-11)\le0$

$+ \qquad - \qquad +$

$7 \qquad 11$

$\therefore\ x\in[7,11]$

Section – B

21. (C)

Let $t=\left(\sqrt{3}+\sqrt{2}\right)^x$.

$\left(\sqrt{3}+\sqrt{2}\right)\left(\sqrt{3}-\sqrt{2}\right)=1$

$\therefore\ \left(\sqrt{3}-\sqrt{2}\right)^x=\dfrac{1}{t}$

$\therefore\ t+\dfrac{1}{t}=10$

$\therefore\ t^2 - 10t + 1 = 0$

$\therefore\ t = \dfrac{10 \pm \sqrt{100-4}}{2} = 5 \pm 2\sqrt{6}$

$\therefore\ \left(\sqrt{3}+\sqrt{2}\right)^x = 5 + 2\sqrt{6}$ or $\left(\sqrt{3}+\sqrt{2}\right)^x = 5 - 2\sqrt{6}$

$\therefore\ x = 2$ or $x = -2$

$\therefore\ S = \{-2, 2\}$

22. (B)

Let the cost of full and half ticket be ₹ x and ₹ $\dfrac{x}{2}$ and reservation charge be ₹ y per ticket.

$\therefore\ x + y = 2530$ and $x + y + \dfrac{x}{2} + y = 3810$

$\therefore\ 3x + 4y = 7620$

On solving for x and y, we get
$x = 2500$ and $y = 30$.

23. (D)

Let $x + \dfrac{1}{x} = t$

$\therefore\ 3\left(t^2 - 2\right) - 2t + 5 = 0$

$\therefore\ 3t^2 - 2t - 1 = 0$

$\therefore\ (3t+1)(t-1) = 0$

$\therefore\ t = -\dfrac{1}{3}$ or $t = 1$

$\therefore\ x + \dfrac{1}{x} = -\dfrac{1}{3}$ or $x + \dfrac{1}{x} = 1$

But $x + \dfrac{1}{x} \in (-\infty - 2] \cup [2, \infty)$

$\therefore$ No real value of x.

24. (A)

Let given fraction is $\dfrac{x}{y}$.

$\therefore\ x + y = 2x + 4$ and $\dfrac{x+3}{y+3} = \dfrac{2}{3}$

$\therefore\ x - y = -4$ and $3x - 2y = -3$

$\therefore\ x = 5$ and $y = 9$

$\therefore\ \dfrac{x}{y} = \dfrac{5}{9} \Rightarrow p = 5$ and $q = 9$.

$\therefore\ pq = 45$

25. (A)

Let $a = \sqrt{5 + \sqrt{5 + \sqrt{5 + \ldots .. + \infty}}}$

$\therefore\ a = \sqrt{5 + a}$

$\therefore\ a^2 - a - 5 = 0$

$$\therefore \; a = \frac{1 \pm \sqrt{1+20}}{2} = \frac{1 \pm \sqrt{21}}{2}$$

$$\because \; a > 0, \; a = \frac{1+\sqrt{21}}{2}$$

Section – C

26. (C)

27. (C)

28. (A)

29. (D)

30. (D)