ACE OF PACE

ENGINEERING **Grade X moving to XI** **DATE: 22/03/2026**

Section – A

1. (D)

Let the other root be r, $\sqrt{3}+r=-\frac{a}{2}$ which is rational

$\Rightarrow\ r=-\frac{a}{2}-\sqrt{3}$.

Product of roots, $\sqrt{3}\left(-\frac{a}{2}-\sqrt{3}\right)=\frac{b}{2}$ which is rational.

$\sqrt{3}\left(-\frac{a}{2}-\sqrt{3}\right)$ is rational $\Rightarrow a=0$

$b=2\sqrt{3}\left(-\sqrt{3}\right)=-6$

2. (A)

$4ab=a^2+4b^2\Rightarrow(a-2b)^2=0\Rightarrow a=2b$

From $a+2b=10,\ a+a=10\Rightarrow a=5$.

3. (D)

Nothing can be said about degree.

$\because\quad x^4+x^2+1=\left(x^2+x+1\right)\left(x^2-x+1\right)$ & both quadratics have non-real roots, x^4+x^2+1 can be factored but has no real roots.

4. (C)

Remainder has degree < 2. Let it be $ax+b$

$b(x)=\left(x^2-5x+6\right)q(x)+ax+b$

Put $x=3\rightarrow-7=3a+b$

Put $x=2\rightarrow-5=2a+b$

Solving, $a=-2\ \&\ b=-1$

$\therefore$ Reminder is $-2x-1$

5. (A)

$x^2+3x+1=0\Rightarrow x^2+1=-3x\Rightarrow x+\frac{1}{x}=-3$

$\Rightarrow\quad x^2+\frac{1}{x^2}=\left(x+\frac{1}{x}\right)^2-2=9-2=7$

6. (B)

$$\frac{\lambda+5}{2} = \frac{\lambda+2}{3\lambda+8} \neq \frac{1}{2}$$

$$(\lambda+5)(3\lambda+8) = 2(\lambda+2)$$

$$3\lambda^2 + 2^1\lambda + 36 = 0$$

$$\lambda = -3, -4$$

But $\lambda = -4$ make the ratio $\frac{1}{2}$.

So only $\lambda = -3$

7. (C)

$\therefore$ $ac < 0$, $a \neq 0$ & $c \neq 0$

Product of zeros is $\frac{c}{a} = \frac{ac}{a^2} < 0$

$\therefore$ product is negative, they have opposite sign.

8. (C)

$$30x^2 - 3\sqrt{5}\,x - 2\sqrt{5}\,x + 1$$

$$= 3\sqrt{5}\,x\left(2\sqrt{5}x - 1\right) - 1\left(2\sqrt{5}\,x - 1\right)$$

$\therefore$ $a = 3\sqrt{5}$ & $b = 2\sqrt{5}$

9. (A)

Adding the two, $2\left(3^x\right) = 54 \Rightarrow x = 3$

Subtracting the two, $2\left(2^y\right) = 16 \Rightarrow y = 3$

10. (A)

$x^2 + y^2 + 4x + 6y = 10$ … (1)

$2x + 3y = 5$ … (2)

$(1) - 2\times(2) \rightarrow x^2 + y^2 = 0$

This happens only when $x = y = 0$

But it does not satisfy (2)

Hence no solution.

11. (A)

Let present age of father & son be x & y years.

$x = 4y$

$x + 5 = 3(y+5)$

Solving, $4y + 5 = 3y + 15 \Rightarrow y = 10,\; x = 40$

12. (C)

$$p(x) = \left(x^2 - 4x + 3\right)q(x) + 3x$$

By remainder theorem, we want value of

$$p(1) = \left(1^2 - 4\times1 + 3\right)q(1) + 3\times1 = 0\times q(1) + 3 = 3$$

13. (C)
We have replace x with $x-k$
So new zeros will increase by k
$\therefore$ $k+k=2k$ is a zero

14. (B)
$$\frac{x}{x^2+y^2}=\frac{1}{5}$$
$$\frac{y}{x^2+y^2}=\frac{2}{5}$$
Square & add $\Rightarrow$ $\frac{x^2+y^2}{\left(x^2+y^2\right)^2}=\frac{1^2+2^2}{5^2}$
$$\frac{1}{x^2+y^2}=\frac{1}{5}\Rightarrow x^2+y^2=5$$
So $\frac{x}{5}=\frac{1}{5}\Rightarrow x=1$ & $\frac{y}{5}=\frac{2}{5}\Rightarrow y=2$

15. (B)
$$\frac{ab}{a-b}=-3\Rightarrow\frac{a-b}{ab}=-\frac{1}{3}\Rightarrow\frac{1}{b}-\frac{1}{a}=-\frac{1}{3}$$
Similarly $\frac{1}{b}+\frac{1}{a}=-\frac{1}{2}$
Subtracting, $-\frac{2}{a}=-\frac{1}{3}+\frac{1}{2}=\frac{1}{6}\Rightarrow a=-12$

16. (D)
$$9ax^2+3bx+c=a\left(3x\right)^2+b\left(3x\right)+c$$
So we replaced x with 3x. hence roots will get divided by 3.

17. (C)
Let the numbers be x & y
$x+y=76$ … (1)
$$\frac{100-25}{100}x+\frac{100+25}{100}y=71$$
$\Rightarrow$ $3x+5y=284$ … (2)
$$4\times\left(1\right)-\left(2\right)\rightarrow x-y=304-284=20$$

18. (B)
Let the present ages of son & father be x & 4x years
$$\left(x-6\right)\left(4x-6\right)=52$$
$$4x^2-30x-16=0$$
$$2x^2-15x-8=0$$
$$\left(2x+1\right)\left(x-8\right)=0$$
So their ages are $8\,\&\,4\times8=32$ years

19. (C)

$(x+y)^2 = x^2+y^2+2xy = 36+2\times14 = 64$

$\Rightarrow \quad x+y = \pm 8$

When $x+y=8 \rightarrow x^3+y^3 = (x+y)^3 - 3xy(x+y)$

$= 8^3 - 3\times14\times8$

$= 176$

When $x+y=-8 \rightarrow x^3+y^3 = (-8)^3 - 3\times14(-8)$

$= -176$

20. (C)

$9\,ax^2 + 9\,bx + 9c = 9(ax^2+bx+c)$

New polynomial has same zeroes as ax^2+bx+c

Section – B: Challenge Yourself

21. (B)

Observe $(10+3\sqrt{11})(10-3\sqrt{11}) = 1$

Let $(10+3\sqrt{11})^x = t \Rightarrow (10-3\sqrt{11})^x = \frac{1}{t}$.

Equation becomes $t + \frac{1}{t} = 20 \Rightarrow t^2 - 20t + 1 = 0$

$t = \frac{20 \pm \sqrt{400-4}}{2} = 10 \pm 3\sqrt{11}$

$\therefore \quad (10+3\sqrt{11})^x = 10+3\sqrt{11}$ or $(10+3\sqrt{11})^x = 10-3\sqrt{11}$

$\Rightarrow \quad x = 1$ or -1

2. (C)

Square & add: $\frac{(x+y)^2+(x-y)^2}{(x^2+y^2)^2}=p^2+q^2$

$$\frac{2(x^2+y^2)}{(x^2+y^2)^2}=p^2+q^2$$

$$\frac{2}{x^2+y^2}=p^2+q^2$$

$$x^2+y^2=\frac{2}{p^2+q^2}$$

$$P=\frac{x+y}{x^2+y^2}=(x+y)\left(\frac{p^2+q^2}{2}\right)\Rightarrow x+y=\frac{2p}{p^2+q^2}$$

Similarly $x-y=\frac{2q}{p^2+q^2}$

Adding, $2x=\frac{2p+2q}{p^2+q^2}\Rightarrow x=\frac{p+q}{p^2+q^2}$

Subtracting, $2y=\frac{2p-2q}{p^2+q^2}\Rightarrow y=\frac{p-q}{p^2+q^2}$

23. (C)

Let the roots be $\alpha,\ \beta$

$\alpha+\beta=2m, \alpha\beta=8m+4$

Given $|\alpha-\beta|=2\Rightarrow(\alpha-\beta)^2=4$

$\Rightarrow\ (\alpha+\beta)^2-4\alpha\beta=4$

$\Rightarrow\ 4m^2-4(8m+4)=4$

$\Rightarrow\ m^2-8m-5=0$

Sum of roots of this quadratic is 8

24. (D)

Using long division, final remainder is

$(2k-9)x+(k^2-8k+10)$

$\because$ this equals $x+a$ we must have

$2k-9=1\ \Rightarrow k=5$

& $a=k^2-8k+10=5^2-8\times5+10=-5$

25. (D)

Let $2^x=t\ \Rightarrow\ 4^x=t^2$

Equation becomes $t^2-t+16=0$

This has 2 values of $t\Rightarrow$ 2 values of x, say $\alpha\ \&\ \beta$

$\therefore\ 2^\alpha\ \&\ 2^\beta$ are roots of $t^2-t+16=0$

Product of roots, $2^\alpha\cdot2^\beta=\frac{16}{1}\Rightarrow2^{\alpha+\beta}=16$

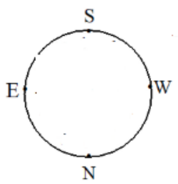
$\therefore\ \alpha+\beta=4$

Section – C: Logical Reasoning

26. (A)
Every alternate number has sum of digits not divisible by 2
$(10000,\ \cancel{10001},\ 10002,\ \cancel{10003})$
Total 5-digit number are 90000
$\therefore$ Answer is $\frac{90000}{2} = 4500$

27. (D)
March 11,1970 (exactly 56 years age) will be same day: Wednesday .February 28 (11 days ago) would be Saturday

28. (D)



29. (D)
The big cube is dimension 4.
The inside cube of dimension 4 – 2 = 2 will
Not be affected
So required number of cubes is $2^3 = 8$

30. (A)
Bell A rings every 10 seconds, bell B rings every 15 seconds
$\because$ $\text{LCM}(10,15) = 30$, they will ring together at 30^{th} second. Before that, will A will ring 3 times (0^{th}, 10^{th}, 20^{th} second)