PACE-IIT & MEDICAL

MUMBAI / DELHI-NCR / PUNE / HYDERABAD / AKOLA / GOA / JALGOAN / BOKARO / AMRAVATI / PATNA / BARAMATI

ACE OF PACE
Grade X moving to XI

ENGINEERING **SOLUTIONS** **DATE: 12/10/2025**

SECTION – A

1. (B)

$$\left(x+\frac{1}{x}\right)^3 = x^3+\frac{1}{x^3}+3\left(x+\frac{1}{x}\right)$$

$$\therefore \quad \left(x+\frac{1}{x}\right)^3 - 3\left(x+\frac{1}{x}\right) = 18$$

$$\therefore \quad x+\frac{1}{x} = 3$$

2. (A)

By remainder theorem,

$P\left(-\frac{1}{2}\right)$ is remainder

$$\therefore \quad \text{Remainder} = -2\left(-\frac{1}{2}\right)^4 + 3\left(-\frac{1}{2}\right)^2 + 10$$

$$= -\frac{1}{8}+\frac{3}{4}+10$$

$$= \frac{85}{8}$$

3. (B)

$$x^2+bx+c = (x-\alpha)(x-\beta)$$

$$\therefore \quad x^2+bx+c = x^2-(\alpha+\beta)x+\alpha\beta$$

On comparing, $\alpha+\beta=-b$ and $\alpha\beta=c$.

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

4. (D)

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

The $5u+3v=-2$ and $3u-v=\frac{8}{5}$

Solving for u and v , we get

$u = \frac{1}{5}$ and $v = -1$

$\therefore \quad 2x + 3y = 5$ and $2x - 3y = -1$

Solving for x and y, we get

$x = 1$ and $y = 1$

$\therefore \quad x^2 + y^2 = 2$

5. (C)

$D = (-3)^2 - 4(7)(K) = -103$

$\therefore \quad 9 - 28K = -103$

$\therefore \quad 28K = 112$

$\therefore \quad K = 4$

$\therefore \quad \sqrt{K} = 2$

6. (C)

$x^2 - 4x + 5 = x - k$

$\therefore \quad x^2 - 5x + 5 + k = 0$

$D = (-5)^2 - 4(5 + k) > 0$ (for two distinct solutions)

$\therefore \quad 25 - 20 - 4k > 0$

$\therefore \quad \frac{5}{4} > k$

$\therefore \quad k = 1$

7. (A)

Let the speed of boat in still water be x km/hr and let the speed of stream be y km/hr.

Now, speed downstream $= x + y$ and speed upstream $= x - y$

From given information,

$$\left.\begin{aligned} &\frac{30}{x-y} + \frac{44}{x+y} = 10 \quad \ldots \quad (i) \\ &\frac{40}{x-y} + \frac{55}{x+y} = 13 \quad \ldots \quad (ii) \end{aligned}\right\} \ (\because \text{speed} = \text{distance} / \text{time})$$

Solving (1) & (2), we get

$x = 8$ and $y = 3$

8. (A)

We have, $(x-a)(x-b) + c = (x-\alpha)(x-\beta)$

$\therefore \quad (x-\alpha)(x-\beta) - c = (x-a)(x-b)$

$\therefore$ Roots are ‘a’ and ‘b’.

9. (D)

Solving $-3x + y = -1$ and $2x + 3y = 8$, we get

$x = 1$ and $y = 2$.

Since all these equations are concurrent,

$(1,2)$ satisfy $5y+k=3x$

$\therefore \quad 5(2)+k=3(1)$

$\therefore \quad k=-7$

10. (A)

We have, $3x^3-ax^2-74x+b=(3x+c)(x^2+2x-24)$

$\therefore \quad 3x^3-ax^2-74x+b=3x^3+(c+6)x^2+(2c-72)x-24c$

On comparing; $c+6=-a$, $2c-72=-74$, $-24c=b$

$\therefore \quad c=-1,\ a=-5,\ b=24$

11. (B)

$$|3x+2|=\frac{5}{2}\Rightarrow 3x+2=\pm\frac{5}{2}\Rightarrow 3x=\frac{1}{2},\frac{-9}{2}\Rightarrow x=\frac{1}{6},\frac{-9}{6}$$

$$\therefore \quad \frac{1}{6}-\frac{9}{6}=\frac{1-9}{6}=\frac{-8}{6}=\frac{-4}{3}$$

12. (C)

Theoretical

13. (D)

$$4(x+y)^2-28(x^2-y^2)+49(x-y)^2$$

$$=4(x+y)^2-28(x+y)(x-y)+49(x-y)^2$$

$$=\left[(2x+2y)-(7x-7y)\right]^2$$

$$=(9y-5x)^2$$

14. (B)

$$\frac{a^2-b^2}{ab}-\frac{b(a-b)}{a(b-a)}=\frac{a^2-b^2+b^2}{ab}=\frac{a^2}{ab}=\frac{a}{b}$$

15. (A)

$$x^4+x^2+1=(x^2+1)^2-x^2=(x^2+x+1)(x^2-x+1)$$

$\therefore \quad k_1=-1$ and $k_2=+1$

$\therefore \quad k_1+k_2=0$

16. (D)

Let $2^{x^2+2}=t$

$\therefore \ t^2-9t+8=0$

$\therefore \ t=1$ or $t=8$

$\therefore \ 2^{x^2+2}=1$ or $2^{x^2+2}=2^3$

$\therefore x^2+2=0$ or $x^2+2=3$

↓

Not possible $\therefore \ x^2=1$

$\therefore \ x=\pm 1$

17. (B)

Sum of roots $= -\frac{b}{a}$

$\therefore \quad \frac{1-4m}{2m-1} = \frac{5}{2}$

$\therefore \quad 2-8m = 10m-5$

$\therefore \quad 18m = 7$

$\therefore \quad m = \frac{7}{18}$

18. (D)

$4k^2 + 2k^2 - 2 + 4 = 0$

$\therefore \quad 6k^2 = -2$

Not possible for real 'k'

19. (A)

For equal roots, $D = 0$

$\therefore \quad (5k)^2 - 4\times 25\times 4 = 0$

$\therefore \quad k^2 = 16$

$\therefore \quad k = \pm 4$

$\therefore \quad 25x^2 + 20x + 4 = 0$ and $25x^2 - 20x + 4 = 0$

$\therefore \quad x = -\frac{2}{5}$ $\qquad\qquad$ $\therefore \quad x = \frac{2}{5}$

20. (D)

Let α is one root of $x^2 + ax + 12 = 0$

$\therefore \quad x^2 + ax + 12 = (x-\alpha)(x-3\alpha) = x^2 - 4\alpha x + 3\alpha^2$

$\therefore \quad a = -4\alpha$ and $12 = 3\alpha^2 \Rightarrow \alpha = \pm 2 \Rightarrow a = \pm 8$

Section – B

21. (C)

Let $y = \sqrt{25 + \sqrt{25 + \sqrt{25 + ... + \infty}}}$

$\therefore \quad y^2 = 25 + y$

$\therefore \quad y^2 - y - 25 = 0$

$\therefore \quad y = \frac{1 \pm \sqrt{1+100}}{2} = \frac{1 \pm \sqrt{101}}{2}$

$\because \quad y > 0,\ y = \frac{1+\sqrt{101}}{2}$

22. (B)

Let α, β be the roots of required quadratic equation

$\therefore \quad (x-\alpha)(x-\beta) = x - (\alpha+\beta)x + \alpha\beta = 0$

According to information given,

$\alpha+\beta=3+2=5$ and

$\alpha\beta=(-6)(1)=-6$

$\therefore \quad x^2-5x-6=0$

$(x-6)(x+1)=0$

$\therefore \quad x=6,-1$

23. (B)

Let's denote the original number of person as x,

Initial amount per person $=\frac{6500}{x}$

New amount per person $=\frac{6500}{x+15}$

$\therefore \quad \frac{6500}{x}-\frac{6500}{x+15}=30 \qquad \therefore \quad x^2+15x-3250=0$

$\therefore \quad 6500\left[\frac{15}{x(x+15)}\right]=30 \quad \therefore \quad x=50,-65$

24. (B)

The total working hours of college = 210 minutes for lapse time due to leaving and entering for each period (excluding the first period) = 5

The duration of all periods $=210-20=190$ minutes

Therefore the duration of each period $=\frac{190}{5}=38$ minutes

25. (C)

Let $x^3+ax^2+bx+1=Q(x)(x-2)(x+2)+3x+4$

At $x=2,\ 4a+2b+9=10$

And $x=-2,\ 4a-2b-7=-2$

$\therefore \quad a=\frac{3}{4}$ and $b=-1$

$\therefore \quad \sqrt{a^2+b^2}=\sqrt{\frac{9}{16}+1}=\sqrt{\frac{25}{16}}=\frac{5}{4}$

Section – C

26. (B)

P (wife) – Q (husband)

Q (father) – R (daughter)

R (mother) – T (child)

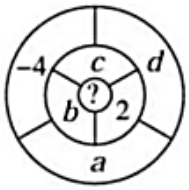
So P becomes grandmother of T

27. (A)

In all the other options having consonant but in the first there is one vowel E available.

28. (B)
D is the 4^{th} term in alphabet
F is the 6^{th} term in alphabet
I is the 9^{th} term in alphabet
M is the 13^{th} term in alphabet

29. (D)
Let the numbers in the four regions that are neighbours to –4 be a, b, c and d as shown in the diagram. The question tells us that a + b + c + d = –4.
However, we also know that a + b + c + d + ? = 2 and hence ? = 6.
(Note: The values a = d = –4 and b = c = 2 give a complete solution to the problem).



30. (B)
When the card is turned about its lower edge, the light grey triangle will be at the top and the dark grey triangle will be on the left. When this is turned about its right-hand edge, the light grey triangle will be at the top and the dark grey triangle will be on the right. Therefore Joanna will see option B.