Model Answer Sheet

Section A

1) 13 (a)

2) a $\left(\frac{4}{3}\right)$

3) d $(a=0, b=-6)$

4) a (real and 2 distinct roots)

5) d $(0,-10)$ and $(4,0)$

6) a (12.20 pm)

7) d $\left(\frac{4}{3}\right)$

8) (d) 90°

9) (d) (A) is false but (R) is true

10) (a) (A) and (R) are true. (R) is correct explanation of (A)

Section B

11 Mid pt. of AB $= \left(\frac{10+K}{2}, \frac{-6+4}{2}\right) = (a,b)$

$$\Rightarrow \frac{10+K}{2} = a \quad \text{and} \quad \frac{-6+4}{2} = \frac{-2}{2} = -1 = b \rightarrow (1)$$

— $\left(\frac{1}{2}\right)$ mark

Subs. value of a and b in $a-2b=18$

$$\frac{10+K}{2} - 2(-1) = 18$$

$$\Rightarrow \frac{10+K}{2} + 2 = 18 \Rightarrow \frac{10+K}{2} = 16$$

$$\Rightarrow 10+K = 32 \Rightarrow \boxed{K=22}$$

— $\left(\frac{1}{2}\right)$ mark

(i) $AB = \sqrt{(10-22)^2 + (-6-4)^2} = \sqrt{(-12)^2 + (-10)^2} = \sqrt{144+100}$

$= \sqrt{244} = 2\sqrt{61}$ units — (1) mark

12) $\cot^2 45° - \sec^2 60° + \sin^2 60° + p = \frac{3}{4}$

$(1)^2 - (2)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 + p = \frac{3}{4}$ — (1) mark

$\Rightarrow 1 - 4 + \frac{3}{4} + p = \frac{3}{4}$

$\Rightarrow -3 + \cancel{\frac{3}{4}} + p = \cancel{\frac{3}{4}}$

$\Rightarrow p = 3$ — (1) mark

13) $3x^2 - 11x - 20 = 0$

$3x^2 - (15-4)x - 20 = 0$

$\Rightarrow 3x^2 - 15x + 4x - 20 = 0$ — $\left(\frac{1}{2}\right)$ mark

$\Rightarrow 3x(x-5) + 4(x-5) = 0$

$\Rightarrow (3x+4)(x-5) = 0$ — $\left(\frac{1}{2}\right)$ mark

either $3x+4=0$ or $x-5=0$

$3x = -4$ $\quad$ $x = 5$

$x = \frac{-4}{3}$ — $\left(\frac{1}{2}\right)$ mark

No Rahul is not correct and zeroes are — $\left(\frac{1}{2}\right)$ mark

$\frac{-4}{3}$ and 5

(14) LHS $(\sin A + \cos A)^2 = (\sqrt{3})^2$

$(\sin^2 A + \cos^2 A) + 2\sin A . \cos A = 3$ — $\left(\frac{1}{2}\right)$ marks

$\Rightarrow 1 + 2\sin A \cdot \cos A = 3$ — $\left(\frac{1}{2}\right)$ mark

$\Rightarrow 2\sin A \cdot \cos A = 3 - 1 = 2$

$\Rightarrow \sin A . \cos A = \frac{2}{2} = 1$ — (1) mark

Or

LHS : $\tan^4 A + \tan^2 A$

$\tan^2 A(\tan^2 A + 1)$ — $\frac{1}{2}$ mark

$\Rightarrow \tan^2 A \cdot \sec^2 A$ — $\frac{1}{2}$ mark

$\Rightarrow (\sec^2 A - 1)\sec^2 A$ — $\frac{1}{2}$ mark

$\Rightarrow \sec^4 A - \sec^2 A$ — $\frac{1}{2}$ mark

Section C

15) Let $\sqrt{3}$ be a rational no in $\frac{p}{q}$ form

i.e $\sqrt{3} = \frac{p}{q}$ where p, q are coprimes and $q \neq 0$ — $\frac{1}{2}$ mark

squaring both the sides

$3 = \frac{p^2}{q^2} \Rightarrow 3q^2 = p^2 \longrightarrow (1)$

p^2 is multiple of 3, so p is also multiple of 3 — (1) mark

$\Rightarrow p = 3c$

Subs. $p = 3c$ in eq (1)

$3q^2 = (3c)^2 \Rightarrow 3q^2 = 9c^2 \Rightarrow q^2 = 3c^2 \rightarrow (2)$ — (1) mark

$\Rightarrow q^2$ is multiples of 3; so q is also multiple of 3

$\rightarrow$ from (1) and (2)

p and q have 3 as common factor and are no longer coprimes

This contradiction arises due to wrong assumption, hence $\sqrt{3}$ is an irrational no. — $\frac{1}{2}$ mark

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(16) $3x^2+11x-4$

$\Rightarrow 3x^2+(12-1)x-4$

$\Rightarrow 3x^2+12x-x-4$

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

$\Rightarrow (3x-1)(x+4)$ — (1) mark

For zeroes

$3x-1=0$ and $x+4=0$

$3x=1$ $\quad x=-4$

$x=\frac{1}{3}$ — (1) mark

Sum of zeroes $=\frac{1}{3}+(-4)=\frac{1-12}{3}=\frac{-11}{3}=\frac{-\text{coefficient of } x}{\text{coefficient of } x^2}$

Product of zeroes $=\frac{1}{3}(-4)=\frac{-4}{3}=\frac{\text{constant}}{\text{coefficient of } x^2}$ — (1) mark

(17) LHS: $\frac{\tan\theta+\sec\theta-1}{\tan\theta-\sec\theta+1}$

$=\frac{\tan\theta+\sec\theta-(\sec^2\theta-\tan^2\theta)}{\tan\theta-\sec\theta+1}$ $(\because 1+\tan^2\theta=\sec^2\theta)$ — (1) mark

$=\frac{(\tan\theta+\sec\theta)-[(\sec\theta+\tan\theta)(\sec\theta-\tan\theta)]}{(\tan\theta-\sec\theta+1)}$ — $\left(\frac{1}{2}\right)$ mark

$=\frac{(\tan\theta+\sec\theta)[1-(\sec\theta-\tan\theta)]}{(\tan\theta-\sec\theta+1)}$ — $\frac{1}{2}$ mark

$=\frac{(\tan\theta+\sec\theta)\cancel{(1-\sec\theta+\tan\theta)}}{\cancel{(\tan\theta-\sec\theta+1)}}=\tan\theta+\sec\theta=\frac{\sin\theta+1}{\cos\theta}$ → (1) mark

Section D.

(18) Let the usual speed of train = x km/hr (S_1)
and new speed = $(x+5)$ km/hr (S_2)

Speed = $\frac{\text{Distance}}{\text{Time}}$ $\Rightarrow$ Time = $\frac{\text{distance}}{\text{speed}}$

$$\frac{360}{x} - \frac{360}{x+5} = \frac{48}{60}$$ — (1) mark

$\Rightarrow 360\left(\frac{1}{x} - \frac{1}{x+5}\right) = \frac{4}{5} \Rightarrow \frac{(x+5)-x}{x(x+5)} = \frac{4}{5} \times \frac{1}{360} = \frac{1}{450}$

$\Rightarrow \frac{x+5-x}{x^2+5x} = \frac{1}{450} \Rightarrow \frac{5}{x^2+5x} = \frac{1}{450}$

$\Rightarrow x^2+5x = 2250 \Rightarrow x^2+5x-2250=0$ — (2) mark

$\Rightarrow x^2+(50-45)x-2250=0$

$\Rightarrow x^2+50x-45x-2250=0$

$\Rightarrow x(x+50)-45(x+50)=0 \Rightarrow (x-45)(x+50)=0$ — (1) mark

$x = -50$ & $x = 45$

as speed cannot be -ve $\therefore$ speed of (usual) train = 45 km/hr $\left(\frac{1}{2}+\frac{1}{2}\right)$ mark

Or

Let the fraction be $\frac{x}{y}$

ATQ $y = 2x+1$

$\therefore$ original fraction = $\frac{x}{2x+1}$ — $\left(\frac{1}{2}\right)$ mark

$$\frac{x}{2x+1} + \frac{2x+1}{x} = 2\frac{16}{21}$$ → (1) mark

$$\Rightarrow \frac{x^2+(2x+1)^2}{x(2x+1)} = \frac{58}{21}$$

$$\Rightarrow \frac{x^2+4x^2+4x+1}{2x^2+x} = \frac{58}{21} \Rightarrow \frac{5x^2+4x+1}{2x^2+x} = \frac{58}{21}$$

$\Rightarrow 105x^2+84x+21 = 116x^2+58x$

$\Rightarrow 11x^2-26x-21=0$ → $(1\frac{1}{2})$ mark

$\Rightarrow 11x^2-33x+7x-21=0$

$\Rightarrow 11x(x-3)+7(x-3)=0 \Rightarrow (x-3)(11x+7)=0$ — (1) mark

either $x-3=0$ or $11x+7=0$

$x=3$ $\quad\quad$ $x=\frac{-7}{11}$ (as fraction cannot be -ve) → $(\frac{1}{2})$ mark

∴ neglecting it

~~speed~~ fraction $= \frac{3}{2(3)+1} = \frac{3}{7}$ — $(\frac{1}{2})$ mark

Section - E

19) (i) Maximum no. of participants in each room

$= HCF(60, 84, 108)$

$60 = 2\times2\times3\times5 = 2^2\times3\times5$

$84 = 2^2\times3\times7$

$108 = 2^2\times3^3$

$HCF = 2^2\times3 = 12$ (12 is the maximum no. of participants) — (1) mark

(ii) Minimum no. of rooms required

$\frac{60}{12} + \frac{84}{12} + \frac{108}{12} = 5 + 7 + 9 = 21$ — (1) mark

(iii) $LCM(60, 84, 108) = 2^2 \times 3^3 \times 5 \times 7 = 3780$ (1+1) marks

Or

$510 = 2 \times 3 \times 5 \times 17$

sum of exponents $= 1+1+1+1 = 4$ — (2) marks

(20) (i) Coordinates of hospital $= (5, 3)$ — (1) mark

(ii) Co-ordinates of school $(1, 6)$ and house $1 = (3, 3)$ (1+1) marks

distance between school and house 1

$= \sqrt{(1-3)^2 + (6-3)^2} = \sqrt{(-2)^2 + (3)^2} = \sqrt{4+9} = \sqrt{13}$ units

$= \sqrt{13}$ Km

Or

(ii) H.3 K H1 1 Police

(2,2) (3,3) (5,5)

$x = 3 = \frac{2 + 5K}{K+1}$; $y = 3 = \frac{5K + 2}{K+1}$ — (1) mark

$\Rightarrow 3(K+1) = 2 + 5K \Rightarrow 3K + 3 = 2 + 5K \Rightarrow 5K - 3K = 3 - 2$

$\Rightarrow 2K = 1 \Rightarrow K : 1 = 1 : 2$

ratio $= 1 : 2$ — (1) mark

(iii) Ordinate of House $2 = 3$ — (1) mark