a remainder of 4 when divided by 5, and a remainder of 5 when divided by 6.

Let n be that number which is smallest.

∴ $n = 6x_1+5$, for some $x_1 \in N$.

$= 5(x_1+1)+x_1$. By given condn, $x_1 = 5x_2+4$ for some $x_2 \in N$.

$= 5(x_1+1)+5x_2+4 = 5(x_1+1+x_2)+4 = 5\left(x_1+1+\frac{x_1-4}{5}\right)+4$

$= 4\left(x_1+1+\frac{x_1-4}{5}+1\right)+\left(x_1+1+\frac{x_1-4}{5}\right)$

$= 4\left(x_1+2+\frac{x_1-4}{5}\right)+\left(\frac{6x_1+1}{5}\right)$. By given condn, $\frac{6x_1+1}{5} = 4x_3+3$ for some $x_3 \in N$

$= 4\left(x_1+2+\frac{x_1-4}{5}\right)+(4x_3+3) = 4\left(x_1+2+\frac{x_1-4}{5}+x_3\right)+3$

$= 4\left(x_1+2+\frac{x_1-4}{5}+\frac{6x_1-14}{20}\right)+3 = 4\left(x_1+2+\frac{x_1-4}{5}+\frac{3x_1-7}{10}\right)+3$

$= 4\left(\frac{10x_1+20+2x_1-8+3x_1-7}{10}\right)+3 = 4\left(\frac{15x_1+5}{10}\right)+3 = 4\left(\frac{3x_1+1}{2}\right)+3$

$= 3\left(\frac{3x_1+1}{2}+1\right)+\frac{3x_1+1}{2} = 3\left(\frac{3x_1+3}{2}\right)+\frac{3x_1+1}{2}$

∴ By given condn, $\frac{3x_1+1}{2} = 3x_4+2$ $\quad x_4 = \frac{x_1-1}{2}$

$= 3\left(\frac{3x_1+3}{2}\right)+3x_4+2$

$= 3\left(\frac{3x_1+3}{2}+x_4\right)+2 = 3\left(\frac{3x_1+3}{2}+\frac{x_1-1}{2}\right)+2 = 3\left(\frac{4x_1+2}{2}\right)+2$

$= 3(2x_1+1)+2 = 2(2x_1+1+1)+(2x_1+1) = 2(2x_1+2)+(2x_1+1)$

∴ $n = 5(x_1+1)+x_1 = 5(5x_2+5)+(5x_2+4) = 30x_2+29 = 4(7x_2+7)+(2x_2+1)$

∴ By given condn, $2x_2+1 = 4x_3+3$ for some $x_3 \in N$.

∴ $x_2 = 2x_3+1$ $\quad n = 30x_2+29 = 30(2x_3+1)+29 = 60x_3+59$

$n = 60x_3+59 = 3(20x_2+19)+2$

$= 2(30x_3+29)+1$

∴ $n = 60x_3+59$ is the ideal form

The smallest such n is 59, when $x_3 = 0$