

Q1 If $\log_5 120 + (x-3) - 2\log_5(1-5^{x-3}) = -\log_5(0.2-5^{x-4})$, then x is

(a) 1

(b) 2

(c) 3

(d) 4

Ans 1

$$1 - 5^{x-3} > 0$$

$$\Rightarrow 5^{x-3} < 1$$

$$\Rightarrow x - 3 < 0$$

$$\Rightarrow x < 3$$

And

$$0.2 - 5^{x-4} > 0$$

$$\Rightarrow 5^{x-4} < 0.2$$

$$\Rightarrow 5^{x-4} < 5^{-1}$$

$$\Rightarrow x - 4 < -1$$

$$\Rightarrow x < 3 \quad \dots\dots(1)$$

$$\log_5 120 + (x-3) - 2\log_5(1-5^{x-3}) = -\log_5(0.2-5^{x-4})$$

$$\Rightarrow \log_5(24 \times 5) + (x-3) - 2\log_5(1-5^{x-3}) = -\log_5(0.2-5^{x-4})$$

$$\Rightarrow \log_5 24 + 1 + (x-3) - 2\log_5(1-5^{x-3}) = -\log_5\{0.2(1-5^{x-3})\}$$

$$\Rightarrow \log_5 24 + x - 2 - 2\log_5(1-5^{x-3}) = -\log_5(0.2) - \log_5(1-5^{x-3})$$

$$\Rightarrow \log_5 24 + x - 2 - \log_5(1-5^{x-3}) = 1$$

$$\Rightarrow \log_5 \left\{ \frac{1-5^{x-3}}{24} \right\} = x-3$$

$$\Rightarrow \frac{1-5^{x-3}}{24} = 5^{x-3}$$

$$\Rightarrow 1 = 25 \cdot 5^{x-3}$$

$$\Rightarrow 1 = 5^{x-1}$$

$$\Rightarrow x - 1 = 0$$

$$\Rightarrow x = 1$$

Hence, the correct option is (a).