

Q10. The solution set of the equation

$$\log_x 2 \log_{2x} 2 = \log_{4x} 2 \text{ is}$$

(a) $\{2^{-\sqrt{2}}, 2^{\sqrt{2}}\}$

(b) $\{1/2, 2\}$

(c) $\{1/4, 2^2\}$

(d) none of these

Ans 10

$$\because \log_x 2 \log_{2x} 2 = \log_{4x} 2$$

$$\because x > 0, 2x \neq 0 \text{ and } 4x > 0 \text{ and}$$

$$x \neq 1, 2x \neq 1, 4x \neq 1$$

$$\Rightarrow x > 0 \text{ and } x \neq 1, \frac{1}{2}, \frac{1}{4}$$

$$\text{Then, } \frac{1}{\log_2 x} \cdot \frac{1}{\log_2 2x} = \frac{1}{\log_2 4x}$$

$$\Rightarrow \log_2 x \cdot \log_2 2x = \log_2 4x$$

$$\Rightarrow \log_2 x \cdot (1 + \log_2 x) = (2 + \log_2 x)$$

$$\Rightarrow (\log_2 x)^2 = 2$$

$$\Rightarrow \log_2 x = \pm\sqrt{2}$$

$$\therefore x = 2^{\pm\sqrt{2}}$$

$$\therefore x = \{2^{-\sqrt{2}}, 2^{\sqrt{2}}\}$$

Hence, the correct option is (a).