4. Let $p, q \in \mathbb{R}$. If $2-\sqrt{3}$ is a root of the quadratic equations, $x^2+px+q=0$, then: [Main April 9, 2019(I)]

(a) $p^2-4q+12=0$ (b) $q^2-4p-16=0$

(c) $q^2+4p+14=0$ (d) $p^2-4q-12=0$

Solution: (d)

Since $2-\sqrt{3}$ is a root of the quadratic equation $x^2+px+q=0$

$\therefore 2+\sqrt{3}$ is the other root.

$$\Rightarrow x^2+px+q = [x-(2-\sqrt{3})]\cdot[x-(2+\sqrt{3})]$$

$$= x^2-(2+\sqrt{3})x-(2-\sqrt{3})x+(2^2-(\sqrt{3})^2)$$

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

Now, by comparing $p=-4, q=1$

$$\Rightarrow p^2-4q-12 = 16-4-12=0.$$