Que: If α and β are the roots of $2x^2 - 7x + 6 = 0$, then find $\frac{\alpha^{-1} + \beta^{-1}}{\alpha^2 + \beta^2}$.

Sol.n: Given quadratic equation is

$$2x^2 - 7x + 6 = 0$$

comparing the above given equation with general equation, we get

$$ax^2 + bx + c = 0$$

$$a = 2, \quad b = -7, \quad c = 6$$

Applying Shridhar Acharya's formula, we get

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-7) \pm \sqrt{(-7)^2 - 4 \cdot 2 \cdot 6}}{2 \cdot 2}$$

$$= \frac{7 \pm \sqrt{49 - 48}}{4}$$

$$= \frac{7 \pm 1}{4}$$

$$= \frac{7+1}{4}, \frac{7-1}{4}$$

$$= \frac{8}{4}, \frac{6}{4}$$

$$= 2, 3/2$$

$\therefore \alpha = 2, \beta = 3/2$

$$\frac{(2)^{-1} + (3/2)^{-1}}{(2)^2 + (3/2)^2} = \frac{1/2 + \frac{2}{3}}{4 + 9/4} = \frac{\frac{3+4}{6}}{\frac{16+9}{4}}$$

$$= \frac{7/6}{25/4}$$

$$= \frac{7}{36} \times \frac{\cancel{4}2}{25}$$

$$= \frac{14}{75}$$