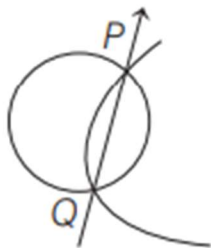**14.** Let $S$ be the focus of the parabola $y^2 = 8x$ and $PQ$ be the common chord of the circle $x^2 + y^2 - 2x - 4y = 0$ and the given parabola. The area of $\Delta PQS$ is                    **(2012)**

Solution: -

**14. PLAN** Parametric coordinates for $y^2 = 4ax$ are $(at^2, 2at)$.



**Description of Situation** As the circle intersects the parabola at $P$ and $Q$. Thus, points $P$ and $Q$ should satisfy circle.

$$P(2t^2, 4t) \text{ should lie on } x^2 + y^2 - 2x - 4y = 0$$

$$\Rightarrow \quad 4t^4 + 16t^2 - 4t^2 - 16t = 0$$

$$\Rightarrow \quad 4t^4 + 12t^2 - 16t = 0$$

$$\Rightarrow \quad 4t(t^3 + 3t - 4) = 0$$

$$\Rightarrow \quad 4t(t-1)(t^2 + t + 4) = 0$$

$$\therefore \quad t = 0, 1$$

$\Rightarrow P(2,4)$ and $PQ$ is the diameter of circle.

Thus, area of $\Delta PQS = \dfrac{1}{2} \cdot OS \times PQ = \dfrac{1}{2} \cdot (2) \cdot (4) = 4$