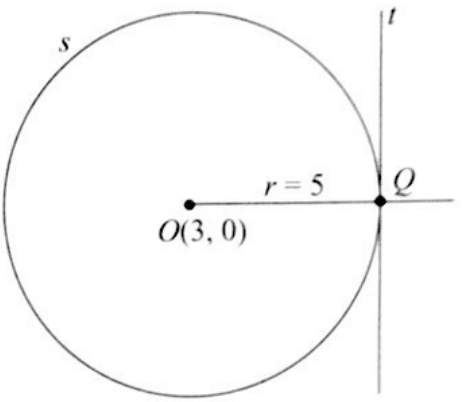
QUESTION 2 (25 MARKS)



Slope of t: $m = -\frac{4}{3}$

Circle s: Centre $O(3, 0)$, $r = 5$

Equation of OQ: Point $O(3, 0)$, $m = \frac{3}{4}$

$m = \frac{3}{4}$

$y - 0 = \frac{3}{4}(x - 3)$

$4y = 3x - 9$

$3x - 4y - 9 = 0$

Find the point of intersection of lines t and OQ.

$4x + 3y + 13 = 0 (\times 3)$

$3x - 4y - 9 = 0 (\times -4)$

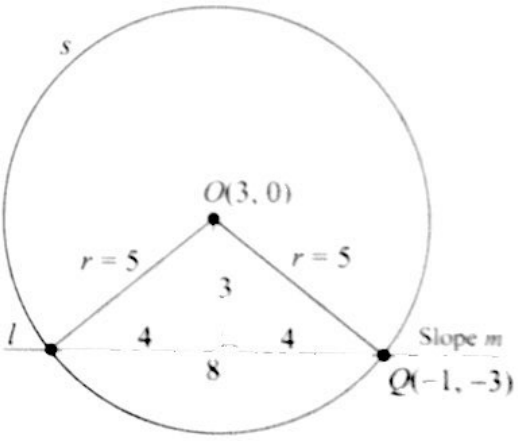
$$\begin{array}{r} 12x + 9y + 39 = 0 \\ -12x + 16y + 36 = 0 \\ \hline 25y + 75 = 0 \Rightarrow y = -3 \end{array}$$

$y = -3 : 4x + 3(-3) + 13 = 0 \Rightarrow 4x = -4$

$\therefore x = -1$

Point of contact $Q(-1, -3)$

The perpendicular line from O bisects the chord.
The distance from the centre to the chord is 3.



The chord passing through Q is called l.

$l : mx - y + k = 0$

$Q(-1, -3) \in l : -m + 3 + k = 0 \Rightarrow k = m - 3$

$l : mx - y + m - 3 = 0$

$d = \dfrac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$

$d = 3, (x_1, y_1) = (3, 0)$

$l : mx - y + m - 3 = 0$

$3 = \dfrac{|m(3) - (0) + m - 3|}{\sqrt{m^2 + 1}}$ [The perpendicular distance of the chord l from the centre O is 3]

$3\sqrt{m^2 + 1} = |3m + m - 3|$

$3\sqrt{m^2 + 1} = |4m - 3|$

$9m^2 + 9 = 16m^2 - 24m + 9$

$7m^2 - 24m = 0$

$m(7m - 24) = 0$

$m = 0, \frac{24}{7}$