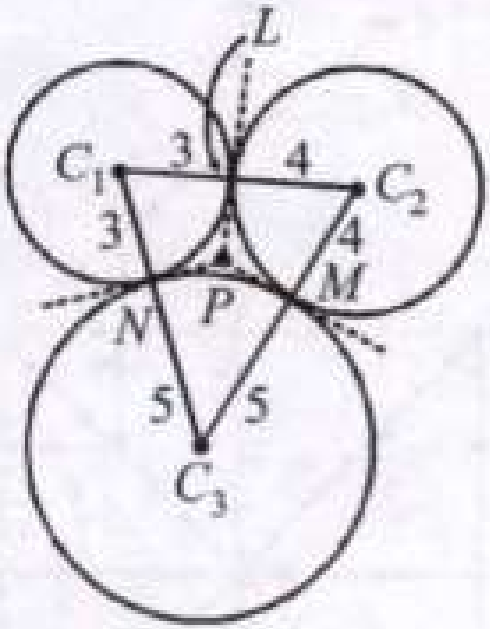
Q4. Circles with radii 3, 4 and 5 touch each other externally. If P is the point of intersection of tangents to these circles at their points of contact, find the distance of P from the points of contact. **[2005 - 2 Marks]**

Sol 4. **Given :** Three circles with centres at C_1, C_2, C_3 and with radii 3, 4 and 5 respectively. These three circles touch each other externally as shown in the figure.



P is the point of intersection of the three tangents drawn at the points of contacts L, M and N. Since lengths of tangents to a circle from a point are equal,

$\therefore \quad PL = PM = PN$

Also $PL \perp C_1C_2, PM \perp C_2C_3, PN \perp C_1C_3$

Clearly P is the incentre of $\Delta C_1C_2C_3$ and its distance from point of contact i.e., PL is the radius of incircle of $\Delta C_1C_2C_3$.

In $\Delta C_1C_2C_3$, sides are

$$a = 3+4 = 7, b = 4+5 = 9, c = 5+3 = 8$$

$$\therefore \quad s = \frac{a+b+c}{2} = 12, \quad \therefore \Delta = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{12 \times 5 \times 3 \times 4} = 12\sqrt{5}, \text{ Now } r = \frac{\Delta}{s} = \frac{12\sqrt{5}}{12} = \sqrt{5}$$