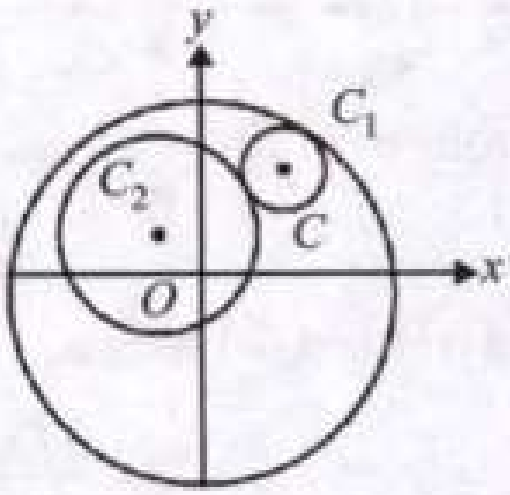
Q5. Let C_1 and C_2 be two circles with C_2 lying inside C_1. A circle C lying inside C_1 touches C_1 internally and C_2 externally. Identify the locus of the centre of C.

[2001 - 5 Marks]

Sol 5.



Let centre of C be (h, k) and radius be r, then by the given conditions.

$$\sqrt{(h-a)^2+(k-b)^2} = r + r_2 \text{ and } \sqrt{h^2+k^2} = r_1 - r$$

$$\Rightarrow \sqrt{(h-a)^2+(k-b)^2} + \sqrt{h^2+k^2} = r_1 + r_2$$

Equation of required locus is

$$\sqrt{(x-a)^2+(y-b)^2} + \sqrt{x^2+y^2} = r_1 + r_2,$$

which represents an ellipse whose foci are at (a, b) and $(0, 0)$.

[$\because PS + PS' =$ constant $\Rightarrow$ locus of P is an ellipse with foci at S and S']