

3

$$1. (x_A - x_D)^2 + (y_A - y_D)^2 = r_{AD}^2 \quad \text{--- (1)}$$

$$(x_B - x_D)^2 + (y_B - y_D)^2 = r_{BD}^2 \quad \text{--- (2)}$$

$$(x_C - x_D)^2 + (y_C - y_D)^2 = r_{CD}^2 \quad \text{--- (3)}$$

Substituting (3) from (1) and (2), we get

$$2(x_C - x_A)x_D + 2(y_C - y_A)y_D = (r_{AD}^2 - r_{CD}^2) - (x_A^2 - x_C^2) - (y_A^2 - y_C^2)$$

$$2(x_C - x_B)x_D + 2(y_C - y_B)y_D = (r_{BD}^2 - r_{CD}^2) - (x_B^2 - x_C^2) - (y_B^2 - y_C^2)$$

$$2 \begin{bmatrix} x_C - x_A & y_C - y_A \\ x_C - x_B & y_C - y_B \end{bmatrix} \begin{bmatrix} x_D \\ y_D \end{bmatrix} = \begin{bmatrix} (r_{AD}^2 - r_{CD}^2) - (x_A^2 - x_C^2) - (y_A^2 - y_C^2) \\ (r_{BD}^2 - r_{CD}^2) - (x_B^2 - x_C^2) - (y_B^2 - y_C^2) \end{bmatrix}$$

$$2 \begin{bmatrix} -2 & 10 \\ 3 & 5 \end{bmatrix} \begin{bmatrix} x_D \\ y_D \end{bmatrix} = \begin{bmatrix} 15 \\ 8 \end{bmatrix}$$

$$x_D = 1.3125$$

$$y_D = 1.0125$$

$$\therefore (x_D, y_D) = (1.3125, 1.0125)$$