3) If the roots of the equation $x^2 - 8x + a^2 - 6a = 0$ are real distinct, then find all possible values of a.

Solution: Since the roots of the given equation are real and distinct, We must have.

$$D > 0$$

$$\Rightarrow 64 - 4(a^2 - 6a) > 0$$

$$\Rightarrow 4[16 - a^2 + 6a] > 0$$

$$\Rightarrow -4(a^2 - 6a - 16) > 0$$

$$\Rightarrow a^2 - 6a - 16 < 0$$

$$\Rightarrow (a-8)(a+2) < 0$$

$$\Rightarrow -2 < a < 8.$$

Hence, the roots of the given equations are real if a lies between -2 and 8.