Que 3: A wire of length 2 units is cut into two parts which are bent respectively to form a square of side$= x$ units and a circle of radius$= r$ units. If sum of areas of the square and the circle so formed is minimum, then: **[JEE-MAIN 2016]**

$(1) 2x = r$
$(2) 2x = (\pi + 4)r$
$(3) (4 - \pi)x = \pi r$
$(4) x = 2r$

Ans 3:

Let side of square is x and radius of circle is r.

Given that $4x + 2\pi r = 2$

i.e. $2x + \pi r = 1$

$\therefore \quad r = \dfrac{1 - 2x}{\pi} \quad \ldots\ldots\ldots (1)$

Area, $A = x^2 + \pi r^2$

$= x^2 + \dfrac{1}{\pi}(2x - 1)^2$

For minimum value of A

$\frac{dA}{dx} = 0$ gives $x = \frac{2}{\pi + 4} \quad \ldots\ldots\ldots (2)$

From (1) and (2)

$r = \dfrac{1}{\pi + 4}$

$\therefore \quad x = 2r$