6-3

The Given potential is infact consist of two one-dimensional independent potentials.

1. Particle in a box with boundaries at $x=0$ and $x=a$

2. " " " " " " " " at $y=0$ and $y=b$

thus

$$\Psi_{n_x n_y}(x,y) = \sqrt{\frac{2}{a}} \sin\left(\frac{n_x \pi x}{a}\right) \sqrt{\frac{2}{b}} \sin\left(\frac{n_y \pi y}{b}\right)$$

$$E_{n_x n_y} = \frac{n_x^2 \pi^2 \hbar^2}{2ma^2} + \frac{n_y^2 \pi^2 \hbar^2}{2mb^2} = \frac{\pi^2 \hbar^2}{2m}\left(\frac{n_x^2}{a^2} + \frac{n_y^2}{b^2}\right)$$