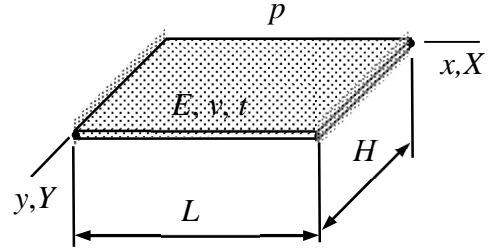Name_____ Student number_____

Assignment 5 (4p)

The rectangle plate shown, of thickness, length and width t, L, and H, is simply supported on edges where $x \in \{0, L\}$ and free on the remaining edges where $y \in \{0, H\}$, and loaded by pressure p acting on the upper surface. Young's modulus E and Poisson's ratio v are constants. Determine the parameter a_0 of the approximation $w(x, y) = a_0(x/L)(1 - x/L)$. Use the principle of virtual work in form $\delta W = 0 \;\; \forall \delta a_0 \in \mathbb{R}$ and

$$\delta W = -\int_\Omega \begin{Bmatrix} \dfrac{\partial^2 \delta w}{\partial x^2} \\[6pt] \dfrac{\partial^2 \delta w}{\partial y^2} \\[6pt] 2\dfrac{\partial^2 \delta w}{\partial x \partial y} \end{Bmatrix}^{\mathrm{T}} D \begin{bmatrix} 1 & v & 0 \\ v & 1 & 0 \\ 0 & 0 & \frac{1}{2}(1-v) \end{bmatrix} \begin{Bmatrix} \dfrac{\partial^2 w}{\partial x^2} \\[6pt] \dfrac{\partial^2 w}{\partial y^2} \\[6pt] 2\dfrac{\partial^2 w}{\partial x \partial y} \end{Bmatrix} dA + \int_\Omega \delta w \, b_n dA .$$