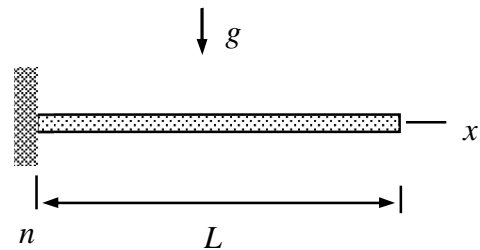


Name \_\_\_\_\_ Student number \_\_\_\_\_

## Assignment 1 (2p)

Find the stress resultants of the plate strip of length  $L$ , width  $H$ , and thickness  $t$  which is loaded by its own weight. Density of the plate material is  $\rho$ . Assume that the resultants do not depend on  $y$ . Use the plate equilibrium equations in the Cartesian system



$$\left\{ \begin{array}{l} \frac{\partial N_{xx}}{\partial x} + \frac{\partial N_{xy}}{\partial y} + b_x \\ \frac{\partial N_{yy}}{\partial y} + \frac{\partial N_{xy}}{\partial x} + b_y \end{array} \right\} = 0 \quad \text{and} \quad \left\{ \begin{array}{l} \frac{\partial Q_x}{\partial x} + \frac{\partial Q_y}{\partial y} + b_n \\ \frac{\partial M_{xx}}{\partial x} + \frac{\partial M_{xy}}{\partial y} - Q_x \\ \frac{\partial M_{yy}}{\partial y} + \frac{\partial M_{xy}}{\partial x} - Q_y \end{array} \right\} = 0 \quad \text{in } (0, L) \times (0, H).$$

### Solution

In plate strip problem, the resultants do not depend on  $y$  and  $Q_y = N_{xy} = M_{xy} = 0$ . The differential equations that are not satisfied automatically and their boundary conditions at the free end simplify to

\_\_\_\_\_ = 0 in  $(0, L)$  and \_\_\_\_\_ = 0 at  $x = L$

\_\_\_\_\_ = 0 in  $(0, L)$  and \_\_\_\_\_ = 0 at  $x = L$

\_\_\_\_\_ = 0 in  $(0, L)$  and \_\_\_\_\_ = 0 at  $x = L$

Solutions to the stress resultants are

$N_{xx}(x) =$  \_\_\_\_\_, ←

$Q_x(x) =$  \_\_\_\_\_, ←

$M_{xx}(x) =$  \_\_\_\_\_, ←