## **CIVL 7111 - Special Modelling Project 9**

Structural Mechanics - Static Deflection of a Simply Supported Plate

**<u>Problem Statement</u>** - Consider the problem of the static deflection of a membrane. The general two-dimensional boundary-value problem is

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{q(x, y)}{T} \qquad \text{in } \Omega$$
$$u = 0 \qquad \text{on } \Gamma$$

where the dependent variable u is the deflection of the membrane, T is the tension in the membrane, and q(x,y) is the transverse loading.



Write the governing equation in non-dimensional form. Using these form of the equation calculate the deflected surface for the following membrane configurations and loading functions:



Use **POIS36** to the model the problems specified in the above diagrams. Compare the finite element solution to an exact solution when possible.