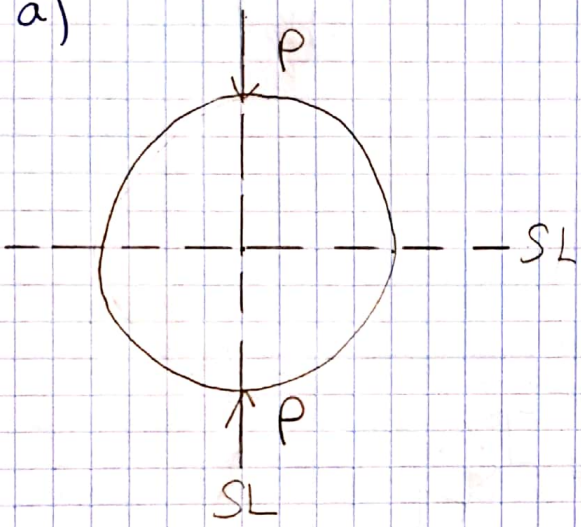
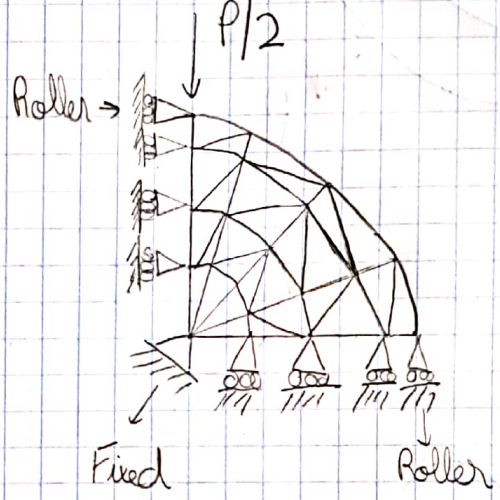
Diego Roldán Ubrlep

Assignment 2.1

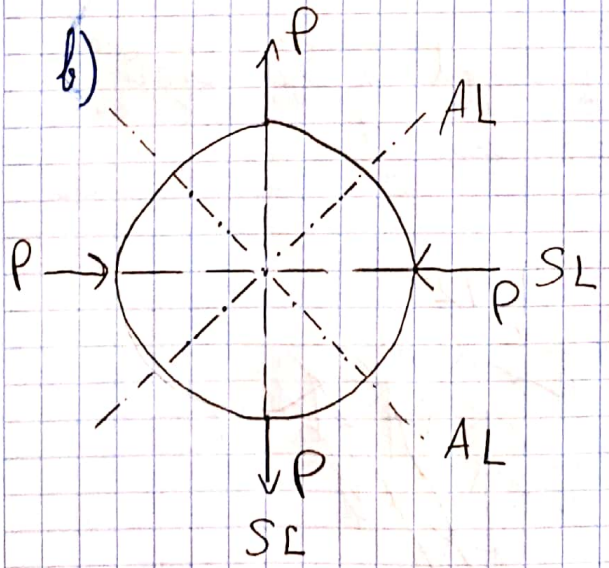
1. Symmetry and antisymmetry

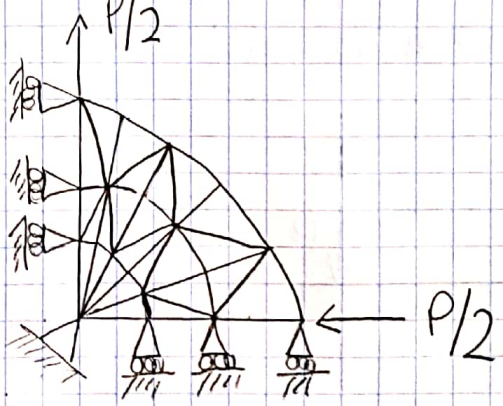
a)





b)

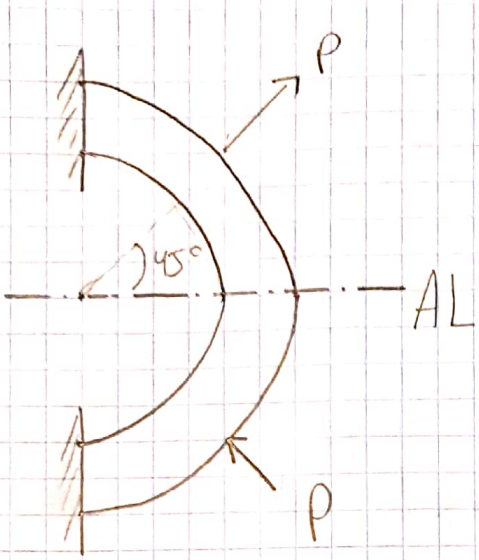


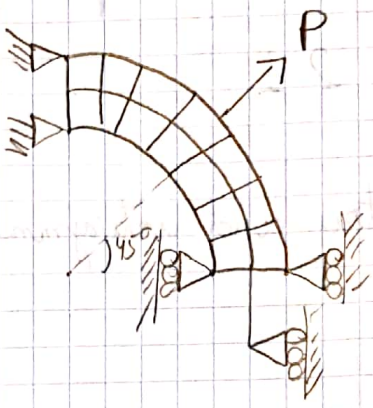


SL: Symmetry line

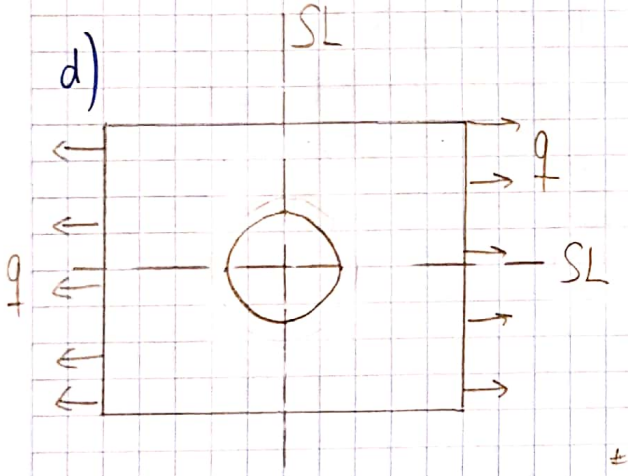
AL: Anti-symmetry line

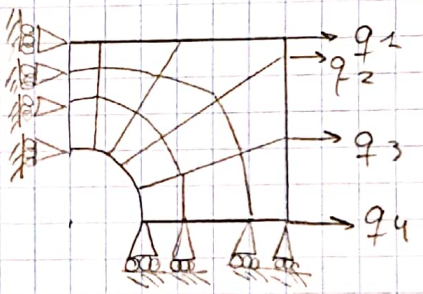
c)





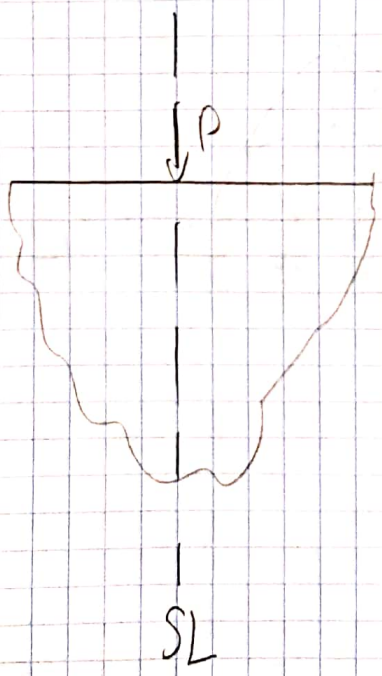
d)

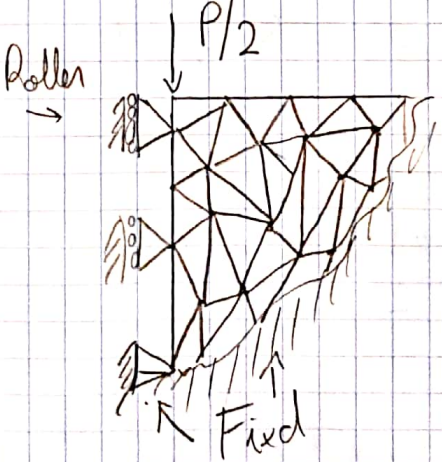




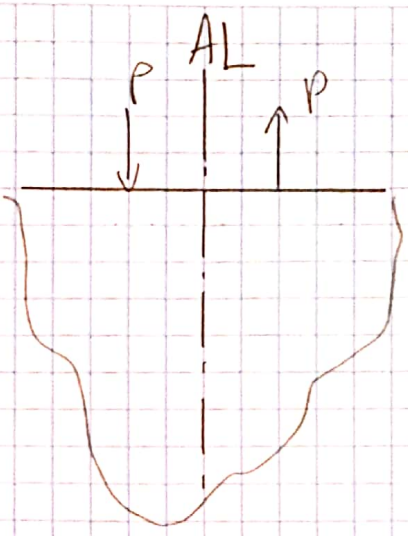
± The q depend on the length of each element

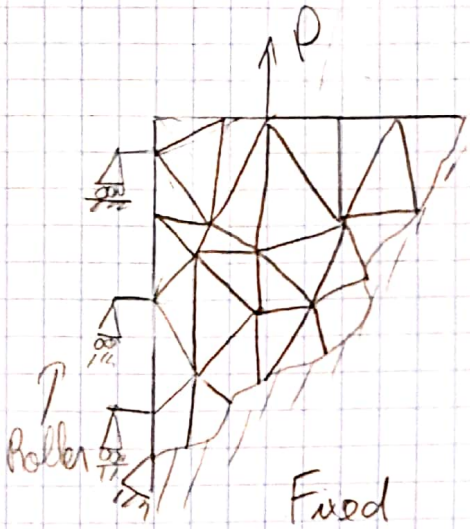
e)





g)





* Discussion:

In symmetries, the displacements are restricted across the plane and free along it. The loads on the symmetry line are divided into 2.

In anti-symmetries, the displacements are restricted along the plane and free across it. There is not any external load on the anti-symmetry lines.

Assignment 2.3

Tapered bar element length ℓ, Areas A_i, A_j

$$A = A_i(1-\xi) + A_j\xi$$

ρ, ω, $q(x) = \rho A \omega^2 x$ $\quad x = x^e$

Consistent node forces?

* Force:

$$F^e = \int_0^\ell q(x)\,dx = \int_0^\ell \rho A(\xi)\,\omega^2 x\,dx$$

$$x = \ell\xi \;; \quad dx = \ell\cdot d\xi \;; \quad A = A_i(1-\xi) + A_j\xi$$

$$\left[F^e = F^1 + F^2\right] \quad \text{Domain } \xi \in [0,1]$$

* Replacing x and A,

$$F^1 = \int_0^1 \rho\omega^2\ell^2\xi\left((1-\xi)\left(A_i(1-\xi) + A_j\xi\right)\right)d\xi$$

$$F^1 = \rho\omega^2\ell^2\left[\frac{1}{2}A_i - \frac{1}{3}A_i + \frac{1}{3}A_j - \frac{1}{3}A_i + \frac{1}{4}A_i - \frac{1}{4}A_j\right];$$

$$\left[F^1 = \frac{\rho\omega^2\ell^2}{12}\left(A_i + A_j\right)\right]$$

* For F^2

$$F^2 = \int_0^1 \rho \omega^2 l^2 \xi \left(\xi \cdot (A_i (1-\xi) + A_j \xi) \right) d\xi$$

$$F^2 = \rho \omega^2 l^2 \left[\frac{1}{3} A_i - \frac{1}{4} A_i + \frac{1}{4} A_j \right] =$$

$$\boxed{F^2 = \frac{\rho \omega^2 l^2}{12} \left[A_i + 3 A_j \right]}$$

$$F^e = F_1 + F_2 = \frac{\rho \omega^2 l^2}{12} \begin{bmatrix} A_i + A_j \\ A_i + 3A_j \end{bmatrix}$$

Setting $A = A_i = A_j$,

$$\boxed{F^e = \frac{\rho \omega^2 l^2 A}{6} \begin{bmatrix} 1 \\ 2 \end{bmatrix}}$$

Assignment 2.2

Difference between “Verification” and “Validation”.

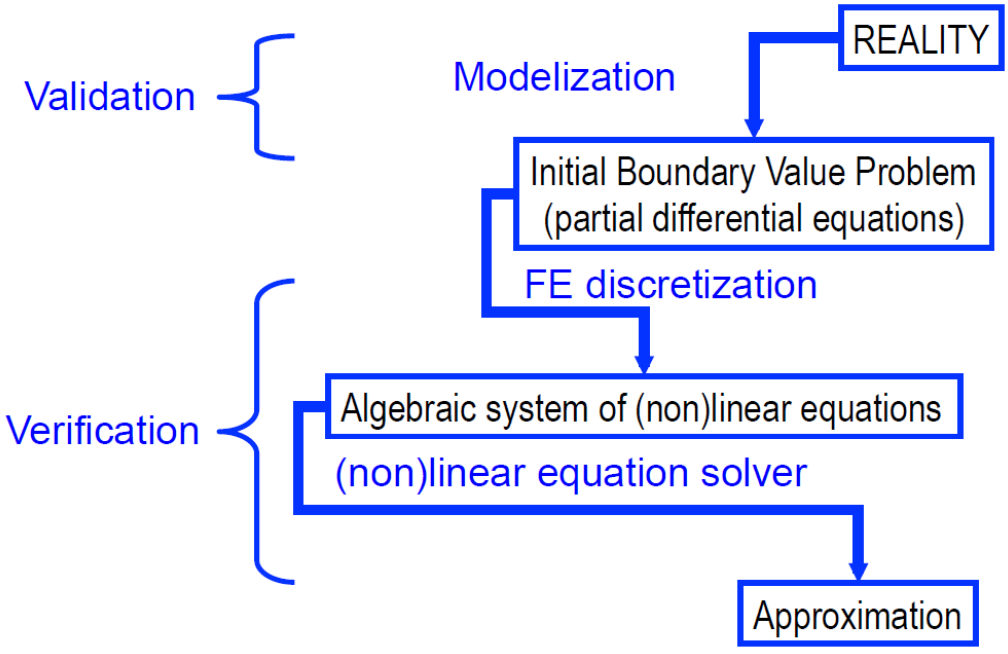
Verification and validation of computer simulation models are carried out during the development of a simulation model with the ultimate goal of producing an accurate and credible model.

Verification and validation of the simulation model begin after the functional specifications have been documented and the initial development of the model has been completed. Verification and validation is an iterative process that takes place throughout the development of a model.

The verification of a model is the process of confirming that it is correctly implemented with respect to the conceptual model (it coincides with the specifications and assumptions that are considered acceptable for the purpose of the application). During verification, the model is tested to find and correct errors in the implementation of the model. Various processes and techniques are used to ensure that the model matches the specifications and assumptions regarding the concept of the model. The objective of the verification of the model is to ensure that the implementation of the model is correct.

The validation verifies the accuracy of the representation of the real system model. Model validation is defined as "justification that a computerized model within its domain of applicability has a satisfactory range of accuracy consistent with the intended application of the model". A model must be constructed for a specific purpose or set of objectives and its validity must be determined for that purpose.

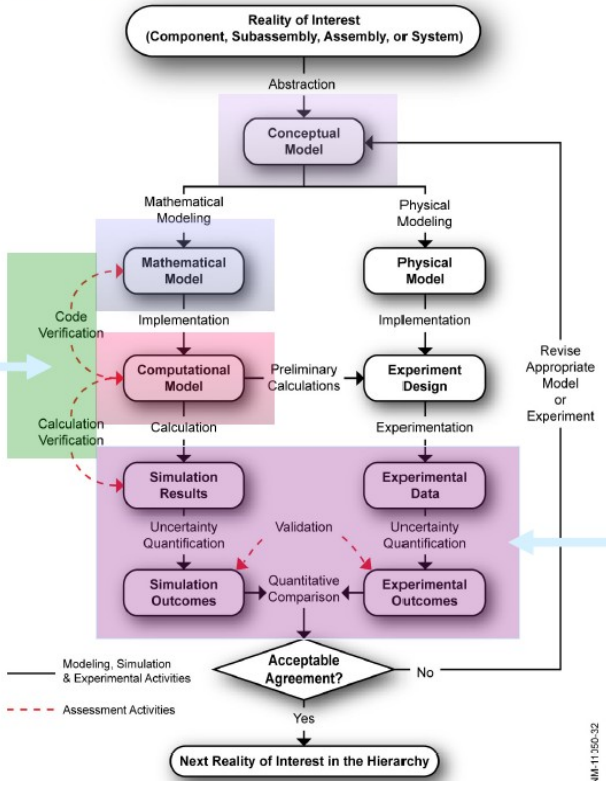
In the following diagrams, it is represented the procedure of Verification and Validation process.



V&V framework

A more comprehensive approach

Verification



Validation