**M1. (MATLAB Assignment)**

In this section, you will accomplish the simple MATLAB program you have developed in the previous assignments. In this homework, you will
-   Calculate the reaction forces
-   Calculate elements internal forces
-   Calculating elements stresses

Download the skeleton file **hw7.m** and **input.txt** before you begin. The input file includes the data (including geometry, boundary conditions, material properties, and loading) required to define the same planar truss given in the previous assignments with material properties $E = 30 \times 10^6\ psi$ and $A = 2\ in^2$ for all elements, and a downward concentrated load applied at node 1.
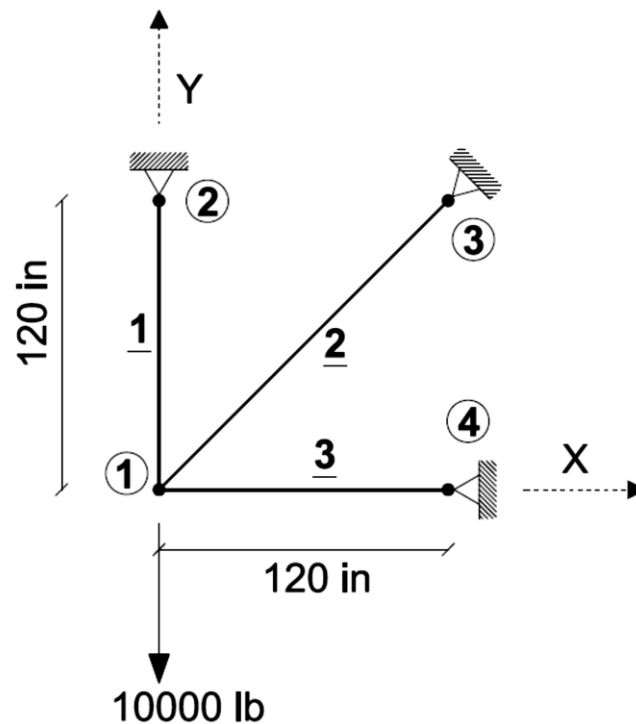
The skeleton m-file reads the input file and generates the required variables including:

o   `nNode`   : Number of nodes,
o   `nElem`   : Number of elements,
o   `coordinates`: An nNode-by-2 matrix including x and y coordinates,
o   `elements`   : An nElem-by-2 matrix including the element connectivity data,
o   E : An nNode-by-1 matrix includes the Young's modulus of elasticity values,
o   A : An nNode-by-1 matrix includes the cross-sectional area of each element,
o   rx: An nNode-by-1 matrix indicates whether a node is free (=1) or restrained (=0) in x-direction,
o   ry: An nNode-by-1 matrix indicates whether a node is free (=1) or restrained (=0) in y-direction.
o   fx: An nNode-by-1 matrix includes the nodal forces component in the x-direction, and
o   fy: An nNode-by-1 matrix includes the nodal forces component in the y-direction.

Your task:

To accomplish this assignment, you need to complete the following tasks:

    a. Calculate the reaction forces. To calculate reaction forces, you will need the obtained displacements vector (u) and the assembled global stiffness matrix (K). Please, read lines 128 to 142 to understand how the displacements are calculated.

    b. Calculate elements internal forces and stresses in the for-loop over elements. For this task, you may need the element stiffness matrices and/or transformation matrices, which you have already obtained in the previous for-loop. To ease your work and avoid redundancy, these values are stored in two three-dimensional arrays, stiffness (line 103) and rotation (line 99), respectively. You can use these variables in the second for-loop (See lines 155 and 156).

    c. Display all values calculated in section (a) and (b) on the MATLAB Command Window. (For instance, you can use `fprintf()` and `disp()` functions)

Important Note:
- You are not allowed to hardcode any values in your code. **You will not get any credit if hardcode any values**. Your program must be able to handle any other input file.

Submission:
Upload your completed version of **hw7.m** to Canvas and **attach** a **hard copy** of (1) <u>your code</u> and (2) <u>Command Window outputs</u> to your submission in class.