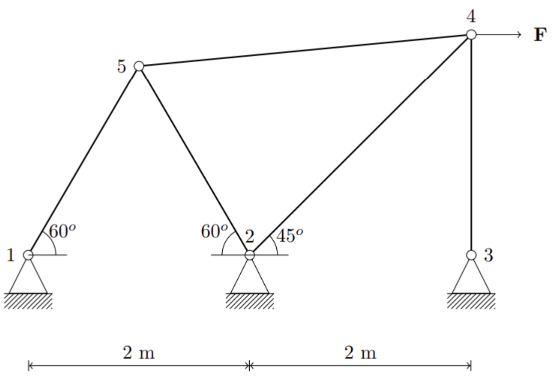
Problem Statement:

Write a numerical code in MATLAB/Python to solve the Truss problems given below (solve for displacements at free nodes, and support at the reactions; use $A = 0.01\,\mathrm{m}^2$, $E = 150\,\mathrm{GPa}$, $\mathbf{F} = 7\,\mathrm{kN}$). You may begin from the example(s) shared in class for the 1D problem, and modify them accordingly to solve these problems. For this case, it is sufficient to write a general function which takes the truss geometry/material data as input, and gives the global stiffness matrix as output. Then, you can apply the boundary conditions and forcing for each problem separately (you can also give this as input to the code by using binary arrays to set the fixed degrees of freedom to zero, as well as a separate force vector). The input array to the function should be of the form:

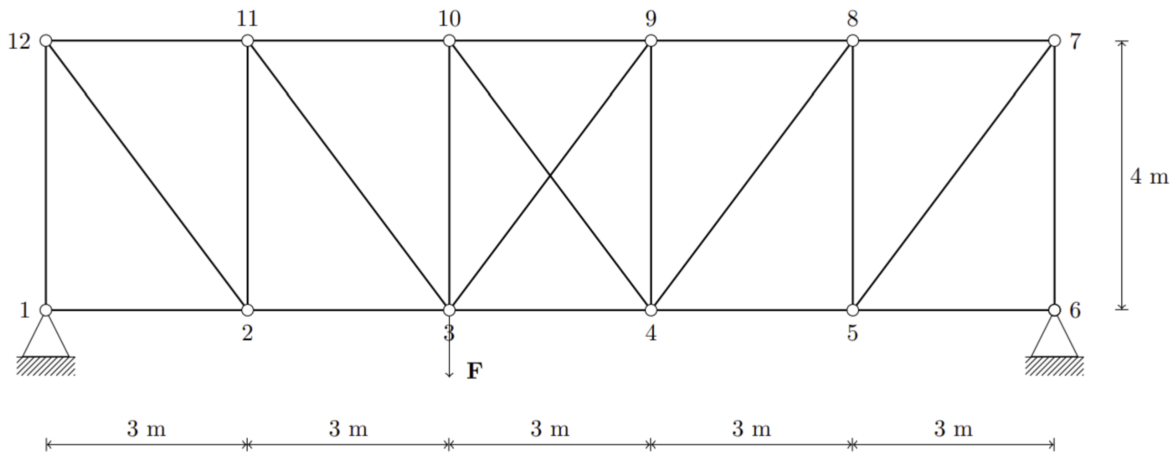
Nodal connectivity 1	Nodal connectivity 2	Angle w.r.t X axis	Element Stiffness

In other words, for each bar in the truss, specify the global node numbers that make up the bar (Nodal connectivity 1 & 2), the angle the individual bar makes w.r.t the X-axis, and the Element Stiffness value (EA/L). The table below gives the data for the first truss structure (the element number is the same as the row index in the table; fill the appropriate value for θ and k^e). Ensure that the order of your node number and the angle measurement is consistent with the coordinate system you choose. You may want to first verify your code and input for the structures you solved in Problem 2 (use appropriate numerical values).

Nodal connectivity 1	Nodal connectivity 2	Angle w.r.t X axis	Element Stiffness
1	5	$60°$	k^1
2	5	$120°$	k^2
2	4	$45°$	k^3
3	4	$90°$	k^4
5	4	$\theta°$	k^5



(a)



(b)