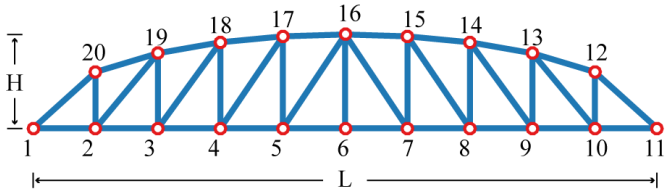
MAE 404/598 Finite Elements in Engineering
Programming assignment #3

Write a MATLAB function that computes the stiffness matrix for a 2D truss structure (example shown below). Each truss element is connected by pin joints and is made of aluminum rods with modulus E = 70 GPa. The rods have a radius of 1 cm.



Instructions for programming and assignment submission:

- For this assignment, you will submit only a single file (MATLAB code).
- Code for generating the mesh is supplied in a MATLAB file named "**make_truss.m**". The mesh connectivity and nodal coordinates are returned in a MATLAB structure (for more details, see http://www.mathworks.com/help/matlab/structures.html)
- The file name **must** be in the format "**asurite_hw3.m**" where asurite is your ASURITE. Note that the separator must be an underscore (not a hypen).
- The file **must** define a function of the same name as the file name (but without the ".m") , e.g.

```
function [K] = asurite_hw3(L, H, nb)
    mesh = make_truss(L, H, nb);
    % Code goes here to compute the stiffness matrix.
end
```

- The order of the input variables and output variables must not be changed.
- **The input variables are:**
  - ***H*:** height of the truss (see above Figure), given in meters.
  - ***L*:** length of the truss, given in meters.
  - ***nb:*** # of pins between truss edge and the midpoint (nb = 6 in the figure).
- **The output variables are:**
  - ***K:*** The stiffness matrix for the model.

Hint: the stiffness matrix of each element is: $\mathbf{K}^e = \left(\mathbf{R}^e\right)^T \cdot \frac{E^e A^e}{l^e} \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix} \cdot \mathbf{R}^e$

Your submission will be graded electronically. Failure to comply with the above instructions may result in zero credit.

Bonus (submit either pdf or word document via Blackboard):

Use the MATLAB quiver plot to show which deformation modes have a zero eigenvalue. Explain the physical significance of these deformations. Show each mode as a separate figure. Upload your assignment to Blackboard prior to the Feb 4 deadline. **Page limit: 1 single-sided page.**

Submit your assignment to http://sparky.fulton.asu.edu/fe/index.php

Can be resubmitted daily until Thursday Feb 4 at 12 midnight.