Computational Structural Mechanics and Dynamics

Assignment 6

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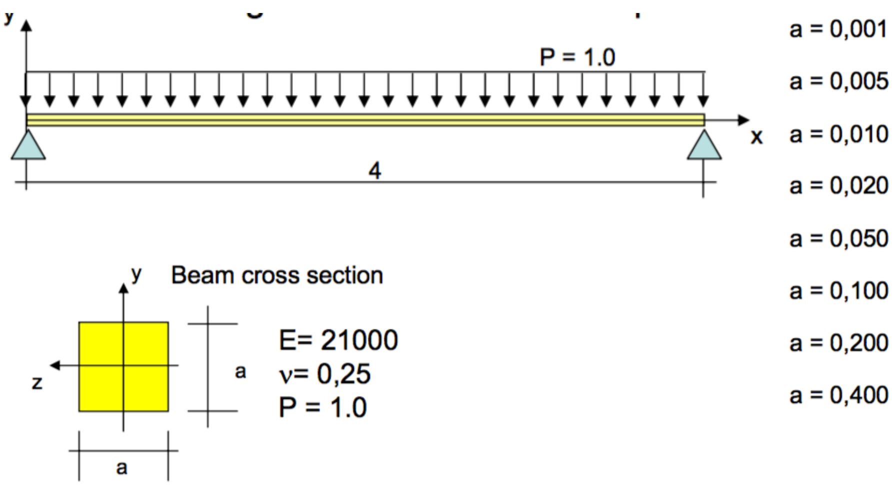
In this assignment we had to program in Matlab the Timoshenko 2 Nodes Beam element with reduced integration for the shear stiffness matrix in a first instance. However, we are going to use the code provided: "Viga_Timoshenko" and "Viga_Euler_Bernoulli".

For the second part of the assignment we need to solve the following problem with:

- 2 nodes Euler Bernoulli element
- 2 nodes Timoshenko Full integration element
- 2 nodes Timoshenko Reduce integration element



By adjusting the thickness of the beam in the Matlab code we get this results.
As we can see, shear is the same for all of them due to the cross section of the beam is a square. So, when changing the thickness parameter "a", we get the same result for all of them.

2-node Euler-Bernoulli					
a	L	a/L	Disp Max	Bend Max	Shear Max
0.001	4	0.00025	-1.90E+09	1.999913	2
0.005	4	0.00125	-3.05E+06	1.999913	2
0.02	4	0.005	-1.19E+04	1.999913	2
0.05	4	0.0125	-3.05E+02	1.999913	2
0.1	4	0.025	-1.904.761.905	1.999913	2
0.2	4	0.05	-1.190.476.191	1.999913	2
0.4	4	0.1	-0.074404762	1.999913	2

2-node-timoshenko-reduced integration					
a	L	a/L	Disp Max	Bend Max	Shear Max
0.001	4	0.00025	-1.90E+09	1.999024	1.96875
0.005	4	0.00125	-3.05E+06	1.999023	1.96875
0.02	4	0.005	-1.19E+04	1.999023	1.96875
0.05	4	0.0125	-3.05E+02	1.999023	1.96875
0.1	4	0.025	-1.906.875	1.999023	1.96875
0.2	4	0.05	-1.197.154.018	1.999023	1.96875
0.4	4	0.1	-0.076161412	1.999023	1.96875

2-node-timoshenko-full integration					
a	L	a/L	Disp Max	Bend Max	Shear Max
0.001	4	0.00025	-1.46E+06	0.001534	1.96875
0.005	4	0.00125	-5.74E+04	0.037658	1.96875
0.02	4	0.005	-2.80E+03	0.469783	1.96875
0.05	4	0.0125	-2.00E+02	1.314426	1.96875
0.1	4	0.025	-1.687.518.104	1.768721	1.96875
0.2	4	0.05	-1.159.637.903	1.936003	1.96875
0.4	4	0.1	-0.075561027	1.982887	1.96875

To conclude, we can say that the different results we get are pretty much the same for Timoshenko 2-noded beam and for 2-noded Euler-Bernoulli. However, we get a different result for 2-noded Timoshenko full integration Maximum Displacements, this may we because of the lack of precision of this last method.