Home Exercise 5

A steel string of length L=1m with a cross section area of A=2mm^2 is pre-tensioned by a force H=500N. Use CALFEM and set up a FE-model of the string by using 30 linear elements and corresponding consistent mass. Use the model to:

a) Determine the three lowest vibration frequencies of the string and the corresponding three lowest modes of vibration.

b) Determine the free vibration response using Calfem and `step2` (undamped system). The string is released from rest in the shape shown below at t = 0. Record *u(L/2,t)* if the string is displaced u_{mid} = 0.01m. Compute for t < 2s.

c) Use the FFT-routine in the Measurements Lecture to analyse the frequency content in the displacement history using the mid displacement from b).

d) Retain only the first four modes in a modal reduction and solve according to b). Compare the solutions of the full and reduced system.