Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Lecture "Methods of Finite Elements II"
Prof. Dr. M. H. Faber

Name :.....

Stud. Nr.:.....

Date :.....

Assignment 4

1. Dynamic analysis of truss system

Idealize the simple truss system shown in Figure 1 as an assemblage of two truss elements and a point mass M attached to the system at node 1. The two truss elements have the same length L, the same elastic modulus E, and the same cross section area A. It is assumed that the structure is subjected to large displacement and large strain, but the material still keeps in its elastic region. It is also assumed that the elements have only stress normal to the cross section, and the stress is constant along the element.

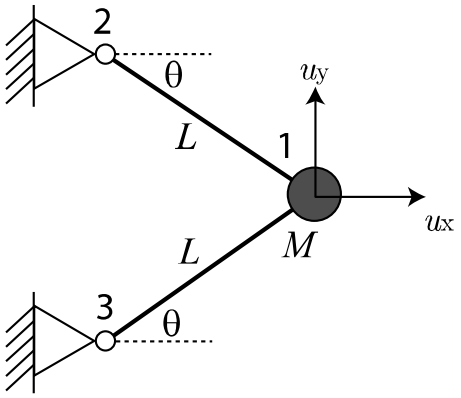

Figure 1. Considered truss system with a point mass

(1.1) Create a nonlinear finite element code in MATLAB for the dynamic analysis of the point mass motion using the Newmark method with $\delta = 1/2$ and $\alpha = 1/4$. Neglect the damping and the gravity force acting to the point mass and the system.

(1.2) Plot the time history of the displacement of the point mass, assuming that $E = 200kN/mm^2$, $A = 100mm^2$, $L = 1000mm$ and $\theta = 30^\circ$. And the initial condition is given as $u_x = 0$, $u_y = -L\sin\theta$ and $\dot{u}_x = \dot{u}_y = 0$.

Note: Please submit the MATLAB code as an .m file in an electronic format.