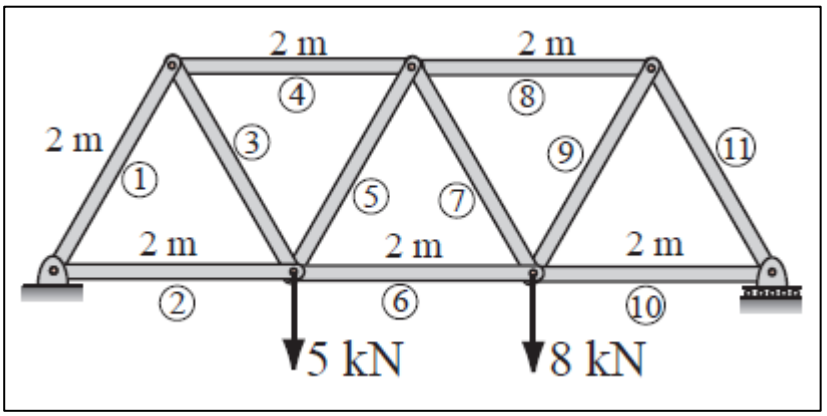
NED UNIVERSITY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINEERING
ME-214 COMPUTER PROGRAMMING & APPLICATIONS
SPRING SEMESTER 2022

Complex Engineering Problem (CEP)

A truss is a structure made of members joined at their ends. For the truss shown in the figure, the forces in the 11 members are determined by solving the following system of 11 equations.



a) Determine the following equations using the knowledge acquired in Statics.

$$\frac{1}{2}F_1 + F_2 = 0, \quad \frac{\sqrt{3}}{2}F_1 = -6, \quad -\frac{1}{2}F_1 + \frac{1}{2}F_3 + F_4 = 0, \quad -\frac{\sqrt{3}}{2}F_1 - \frac{\sqrt{3}}{2}F_3 = 0,$$

$$-F_2 - \frac{1}{2}F_3 + \frac{1}{2}F_5 + F_6 = 0, \quad \frac{\sqrt{3}}{2}F_3 + \frac{\sqrt{3}}{2}F_5 = 5, \quad -F_4 - \frac{1}{2}F_5 + \frac{1}{2}F_7 + F_8 = 0,$$

$$-\frac{\sqrt{3}}{2}F_5 - \frac{\sqrt{3}}{2}F_7 = 0, \quad -F_6 - \frac{1}{2}F_7 + \frac{1}{2}F_9 + F_{10} = 0,$$

$$\frac{\sqrt{3}}{2}F_7 + \frac{\sqrt{3}}{2}F_9 = 8, \quad -F_8 - \frac{1}{2}F_9 + \frac{1}{2}F_{11} = 0$$

b) Using the determined equations in (a) to write a MATLAB script to determine the forces in the members (Do not use inverse of a matrix).

c) Display the results in a table where the first column displays the member number and the second column displays the corresponding force.

d) Which members are assumed to exert tensile forces and which members are assumed to exert compressive forces (Use the equations and the knowledge of statics to answer this question)?

Announcement Date: 11th July 2022
Submission Date: 22th July 2022 (2.30 pm after Jumma Prayer)
Submission Details: All students will submit the CEP in printed form as discussed in classroom through CR. Assignments will not be accepted individually and after submission date.

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