CIV4280 Bridge Design & Assessment
Test for John Murphy (21199229)

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Abstract

This Test explores the topic of direct stiffness method. Familiarity with identifying unknown degrees of freedom, following the step-by-step procedure, and drawing bending moment and torsion moment diagram are necessary. This topic contributes to unit Learning Outcome 3: *Determine the structural behaviour of various bridge types quantitatively and qualitatively using relevant hand- and computer-based methods.* By being competent at analysing simple structures by hand using the stiffness method, you will be better placed to correctly use and understand the output of computer analyses of more complex models.

1 Problem

The symmetric grillage shown in Figure 1 has fixed ends at E and G and pinned ends at D and F. Material and geometric properties are the same for all members:

Using the direct stiffness method, show the rotation at F is 2.63 mrad when the applied $M = 80$ kNm.

Draw the resulting bending and torsion moment diagrams for the applied load shown in Figure 1.

- $L = 3750$ mm

- $I = 37.5 \times 10^6$ mm^4

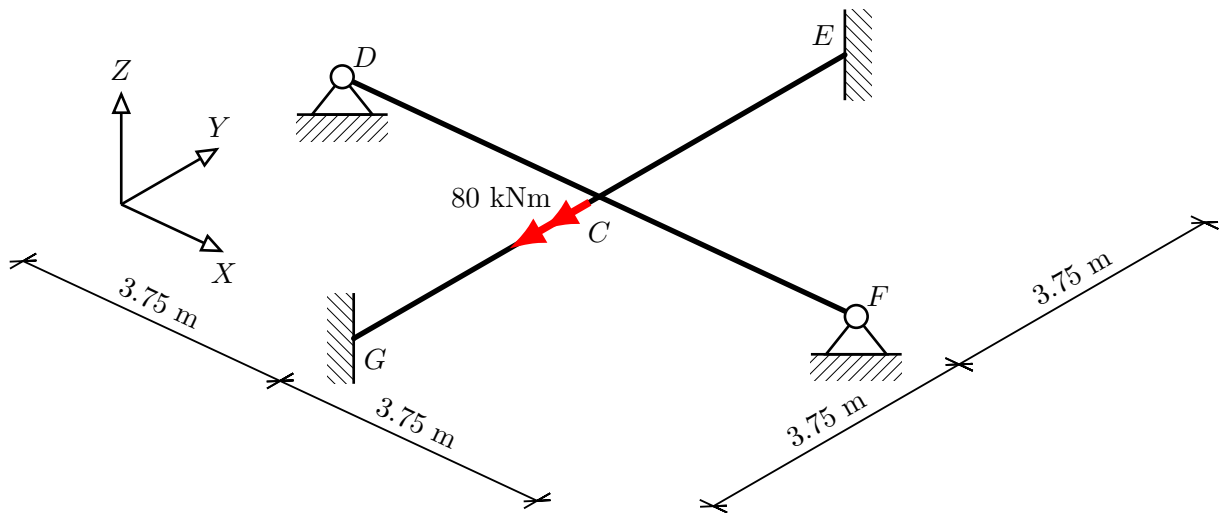- $J = 75 \times 10^6$ mm^4

- $E = 200$ GPa

- $G = 80$ GPa

Figure 1: Grid Problem.