Recitation 5

ASEN 3112 - Spring 2020

Problem 1 (20 mins)

Beam AB is clamped at point B, Fig. 2. Beam has constant bending inertia *I* and elastic modulus *E.* Point force *P* applied at point A. Determine the deflection at point A using the **Conservation of Energy Principle**:

a) Without considering the spring.
b) With considering the effect of a spring with stiffness k.
   Hint: Split the problem into a beam problem and a spring problem; apply the Conservation of Energy principle to these subsystems individually.

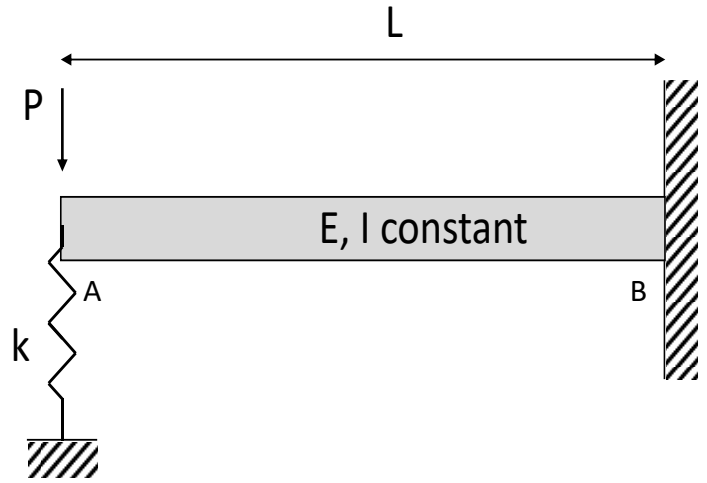

Figure 2: Clamped beam

Problem 2a (15 mins)

Consider the two-bar truss shown in the Fig. 3a. Compute the displacement in horizontal direction at joint B due to the external force P=4.0x10^3 N using **Virtual Displacement Method**

Given:

Area of AB = 0.15 m^2

Area of CB = 0.25 m^2

E for both AB and CB = 3x10^6 Pa

Hint: For a single bar: $\delta W_{ie,bar} = \frac{E\ A}{L}(\Delta L)\,\delta(\Delta L)$

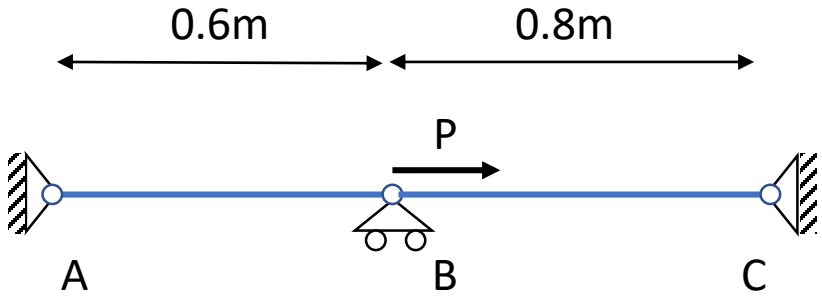

Figure 3a: Two-Bar truss

Problem 2b (25 mins)

Consider the two-bar truss shown in the Fig. 3b. Compute the displacements in vertical and horizontal direction at joint B due to the external force P=4.243x10^3 N inclined at an angle of 45 deg with the horizontal using **Virtual Displacement Method**

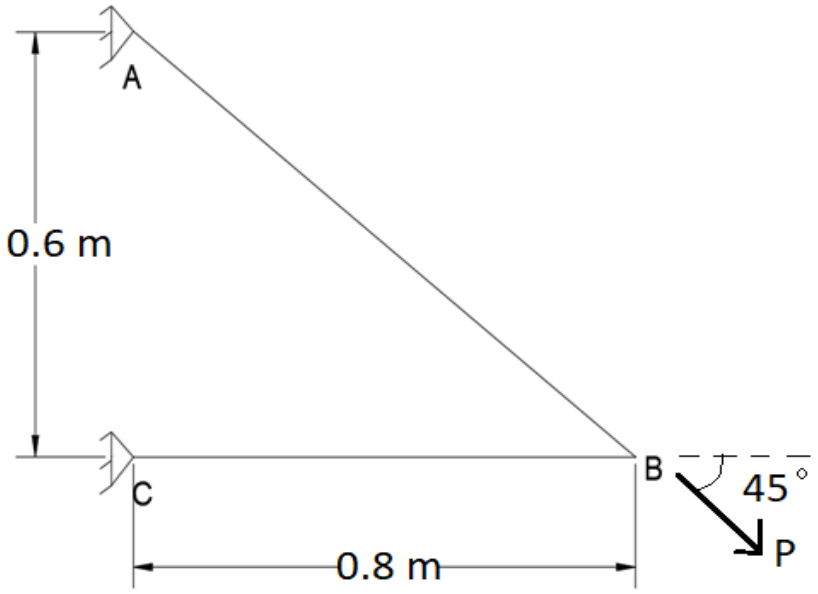

Figure 3b: Two-Bar truss

Given:

Area of AB = 0.15 m^2

Area of CB = 0.25 m^2

E for both AB and CB = 3x10^6 Pa