

SAMPLE MIDTERM

CEE 379

Name: _____

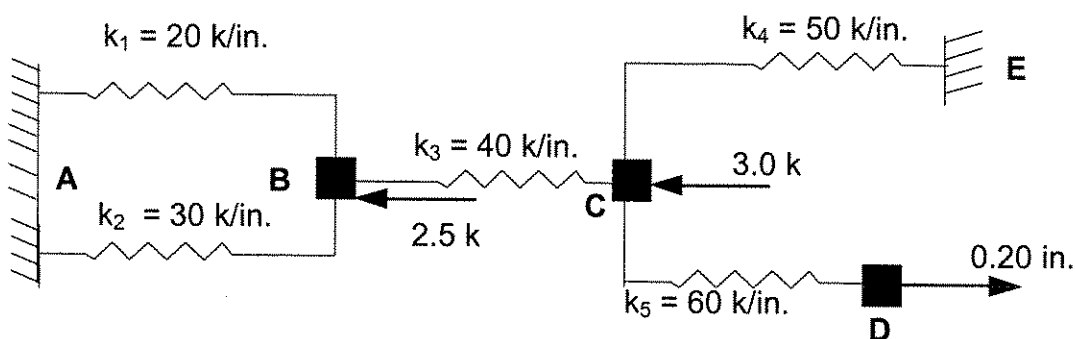
In solving this exam, you are permitted to consult one page of hand-written notes (both sides), which you have prepared. Turn in these exam questions along with your solution.

SHOW ALL WORK

Problem 1 (45)

Consider the one-dimensional spring system shown below. Assume that the nodes move only in the horizontal direction, and that the nodes do not rotate.

The spring system is subjected to two horizontal loads and one imposed displacement, as shown below.



- a. For this spring system, determine the:
- degree of external static indeterminacy
 - degree of internal static indeterminacy
 - degree of kinematic indeterminacy

- b.** For the combination of loads and imposed displacements shown in the figure on the previous page, determine the displacements of all of the nodes (D_A , D_B , D_C , D_D , D_E) using the direct stiffness method presented in class.

- c. Assume that the applied loads shown in the figure are not there. Instead the spring system is subjected to the following set of displacements.

Displacement at A = 0.0 in.
Displacement at B = 0.3 in. to the right
Displacement at C = 0.1 in. to the left.
Displacement at D = 0.2 in. to the right
Displacement at E = 0.0 in.

- i) What are the end forces for spring linking joint B and C? Show the direction of these forces on a sketch of the spring.

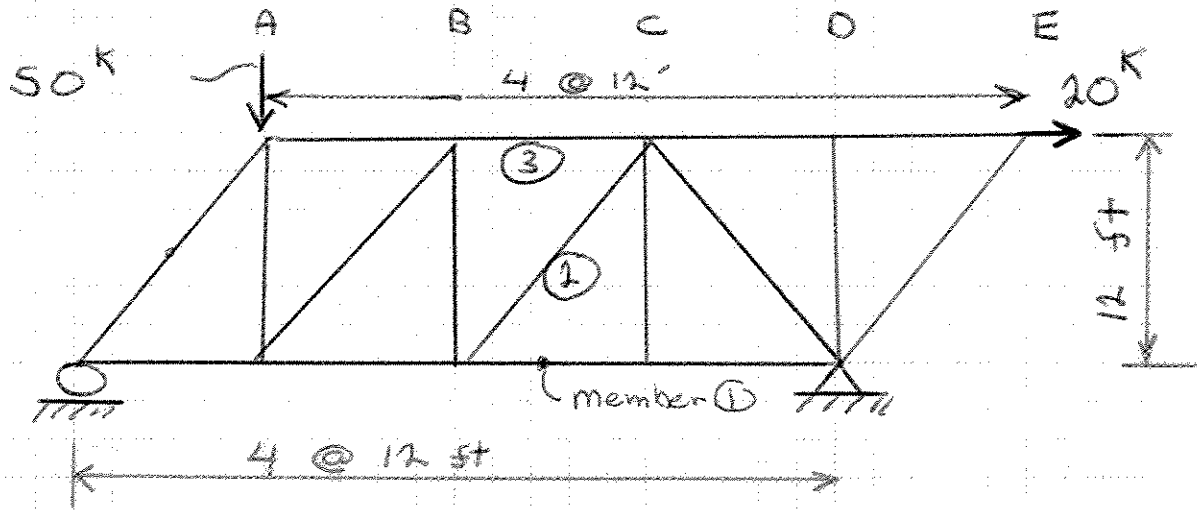
- ii) What is the tension (or compression) force in the spring linking joint B and C?

Problem 2 (10) In class, we discussed many of the approximations that are made in the analysis of two-dimensional trusses with the direct stiffness method.

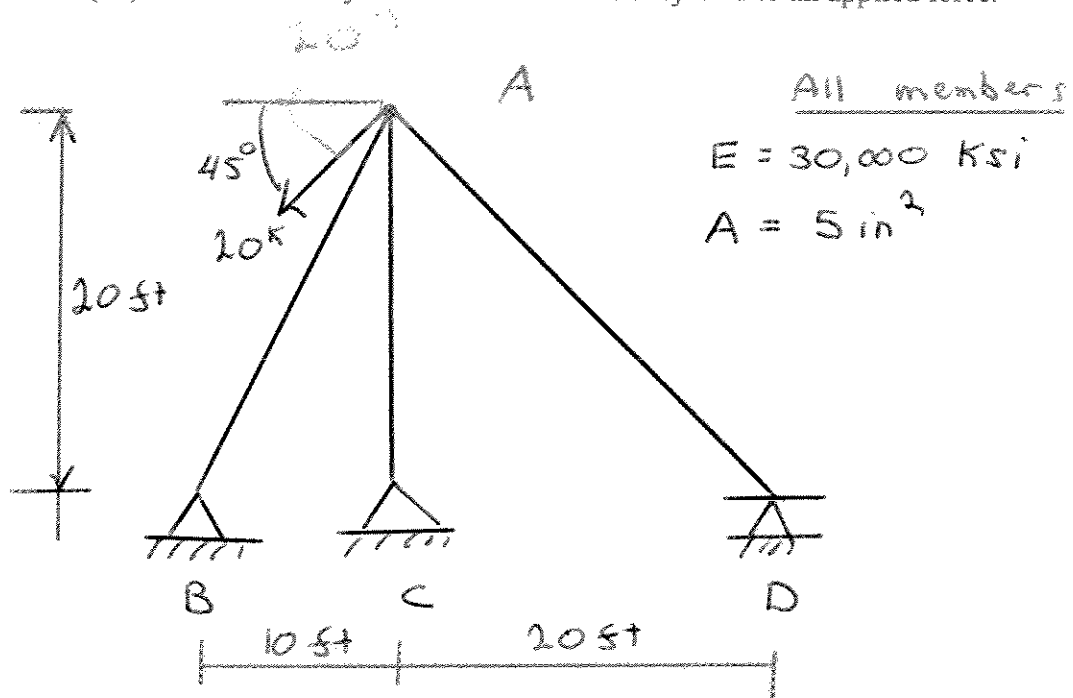
a) Identify (by circling the letter preceding the statement) which of the following assumptions are made in the analyzing 2D trusses with the direct stiffness method discussed in class..

- i) The strains in the members are smaller than the yield strain for the material
- ii) The joint displacements are much smaller than the member lengths
- iii) The member depth is much smaller than its width
- iv) The final orientation of the members is the same as the original orientation (λ_x, λ_y)
- v) The number of truss members is less than 100.
- vi) Truss members do not have any bending deformations

Problem 3 (15) Consider the truss show below. It is subjected to a downward, vertical force at joint A, and a horizontal force at joint E. What are the axial forces in members 1, 2 and 3?



Problem 4 (30) The 2D truss system shown below is subjected to an applied force.



truss

a) If the ~~spring~~ system is to be analyzed with the direct stiffness method, what will be the dimension of K_{11} ?

truss

b) If the ~~spring~~ system is to be analyzed with the direct stiffness method, what will be the dimension of K_{21} ?

c) What are the displacement of the joint A?