In-class portion is 40 Minutes, Open Book, Open Notes

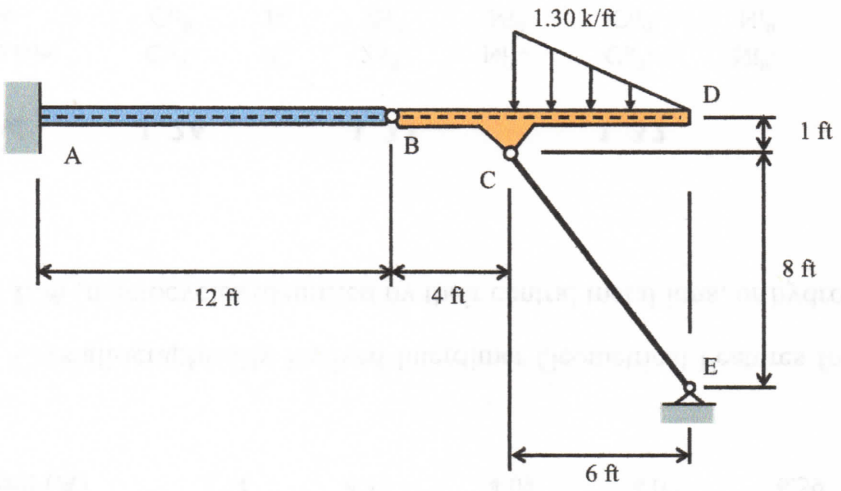
Please clearly indicate your final answers;

For credit, you must show calculations and free-body diagrams that support your answers.

Use the sign convention below for all problems

- Tension positive for all truss members;
- Vertical support reactions are positive upward;
- Horizontal support reactions are positive to the right;
- Reactive support moments are positive counter-clockwise.

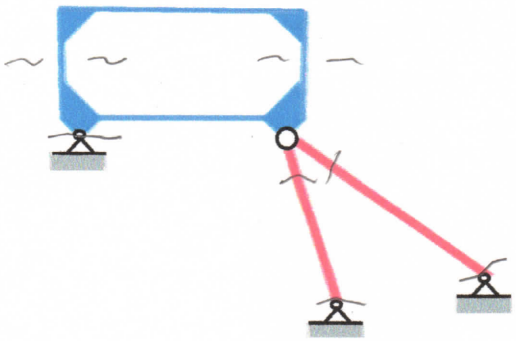
Problem 1 (7 points)



The stable beam shown above is supported by a rigid support at point **A** and a member that is pin connected at points **C** and **E**. The beam has an internal hinge at point **B**.

Neglecting the weight of the members and due to the loading shown, find the **support reaction at the rigid support at point A**. Report the magnitude and sign of each support reaction component based on the given sign convention. For the out-of-class portion, show complete Free-Body Diagrams (FBDs) and calculations that support your results.

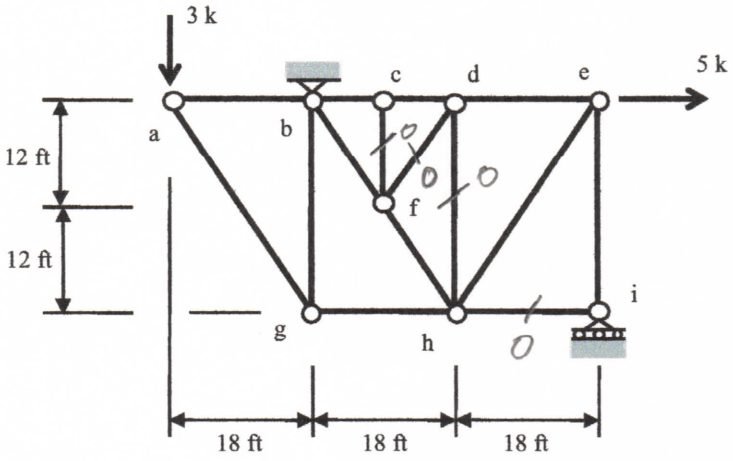
Problem 2 (3 points)



For the structure shown above, subjected to general loading, determine if it is **Determinate, Indeterminate, or Unstable**.

If **Indeterminate**, indicate the degree of indeterminacy. If **Unstable**, indicate if the instability is due to partial or improper constraints. For the out-of-class portion, show complete Free-Body Diagrams that support your results.

Problem 3 (5 points)



For the pin connected stable truss, subjected to the point loads shown and pin supported at joint **b** and a roller support at joint **i**, calculate the following:

1. (2 points) Are there any zero-force members? If so, indicate them.

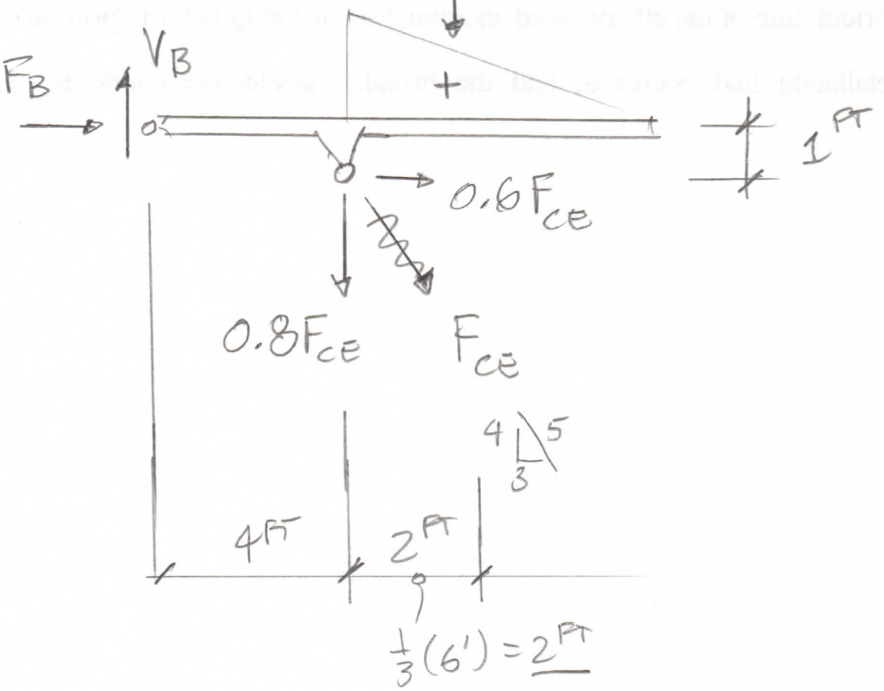
2. (3 points) Using the **Method of Joints**, find the internal force in member **ab** and indicate the sign based on the given sign convention. For the out-of-class portion, show complete Free-Body Diagrams and calculations that support your results.

CE 160 MIDTERM QUIZ #1 FALL 2020

CE IS A TWO-FORCE MEMBER

FBD OF BCD

$(\frac{1}{2})(1.3^{K/FT})(6^{FT}) = 3.9^{K}$



$\circlearrowleft \Sigma M_B = 0 \quad -3.9(6) + 0.6F_{CE}(1) - 0.8F_{CE}(4) = 0$

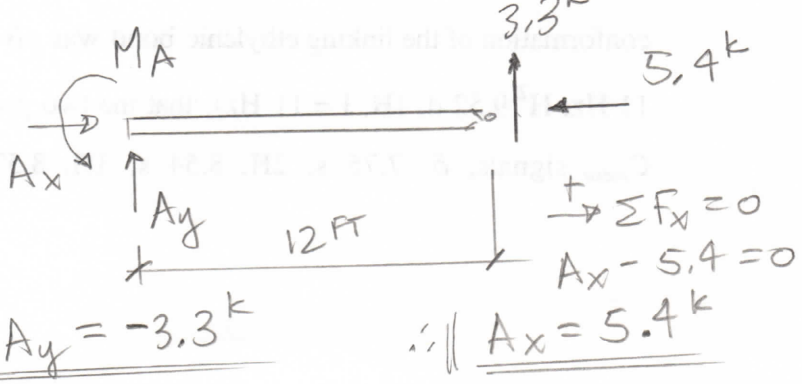
$-2.6F_{CE} = 23.4 \qquad F_{CE} = -9^{K}$

$\pm\rightarrow \Sigma F_x = 0: \quad F_B + 0.6F_{CE} = 0 \qquad F_B = 5.4^{K}$ (−9)

$+\uparrow \Sigma F_y = 0: \quad V_B - 0.8F_{CE} - 3.9 = 0$ (−9)

$V_B = -3.3^{K}$

FBD OF AB



$\circlearrowleft \Sigma M_A = 0$

$M_A + 3.3(12) = 0$

$\therefore \| M_A = -39.6^{K\text{-}FT}$

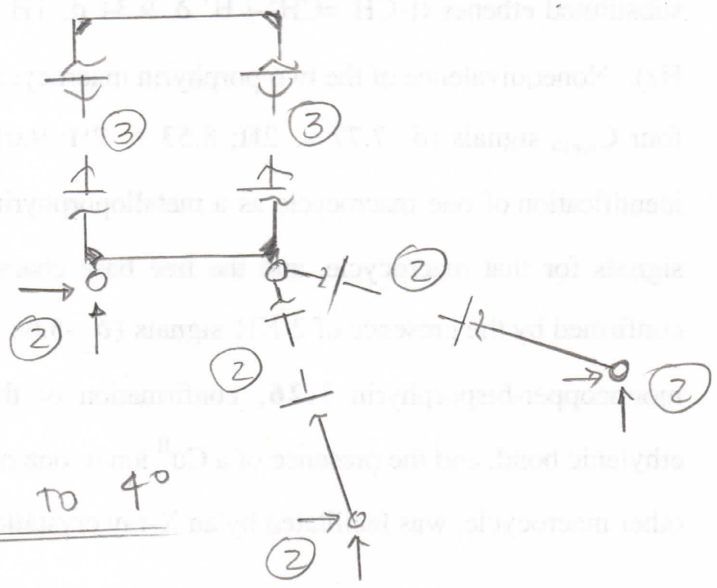
$+\uparrow \Sigma F_y = 0 \quad A_y + 3.3 = 0 \quad \therefore \| A_y = -3.3^{K}$

$\pm\rightarrow \Sigma F_x = 0$

$A_x - 5.4 = 0 \quad \therefore \| A_x = 5.4^{K}$

PROBLEM 2

FBDs



$X = 16$

$n = 4$

$3n = 3(4) = 12$

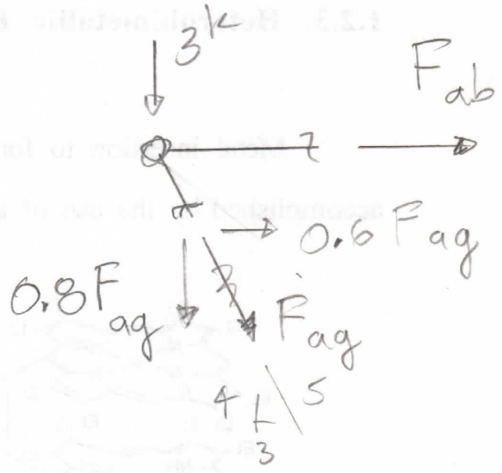
$16 - 12 = 4$

INDETERMINATE TO 4°

PROBLEM 3

1) cf, fd, dh, hi

2) FBD OF JOINT a



$+\uparrow \Sigma F_y = 0$

$-3 - 0.8F_{ag} = 0$

$F_{ag} = -3.75^{k}$

$\rightarrow \Sigma F_x = 0$

$F_{ab} + 0.6F_{ag} = 0$ (−3.75)

$\therefore F_{ab} = 2.25^{k}$