MIDDLE EAST TECHNICAL UNIVERSITY

MECHANICAL ENGINEERING DEPARTMENT

ME 205 STATICS – FALL 2018

SECTION 1

HOMEWORK #3

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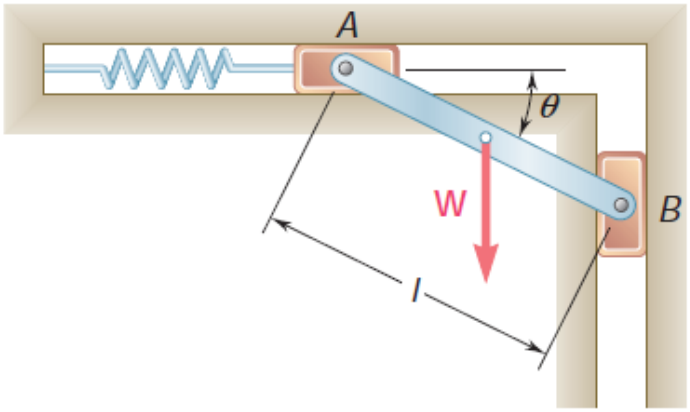
Assigned Date: 28.11.2018
Due Date: 05.12.2018
Due Time: 14.00
Grading Due Date: 12.12.2018

Please include your name, student ID, due date, a proper headline, page number with total page number, and units in your homework. Neatness will be graded.

1. The rod *AB* is attached to the block *A* which can translate freely in the x – axis and the block *B* which can translate freely in the y – axis. The weight of the rod is W, the length of the rod is l, and the spring constant is k. The spring is unstretched when $\theta = 0$. The weights of the blocks are neglected. Determine,

a. The equilibrium equation in terms of W, k, l, and θ (*20 pts*),
b. The value of θ when $W = 2kl$. (*6 pts*)

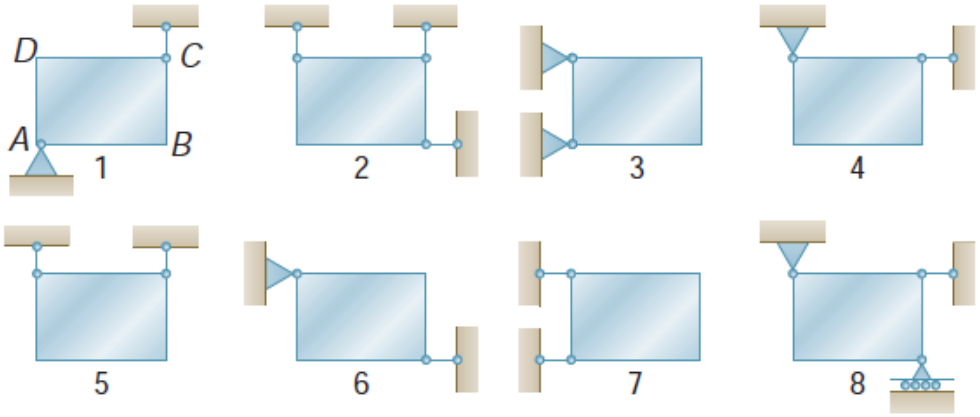


2. In the following figure, there are 8 plates, each of dimensions 400 x 250-mm and weight 200-N. The plates are held in vertical plane. In each case, determine

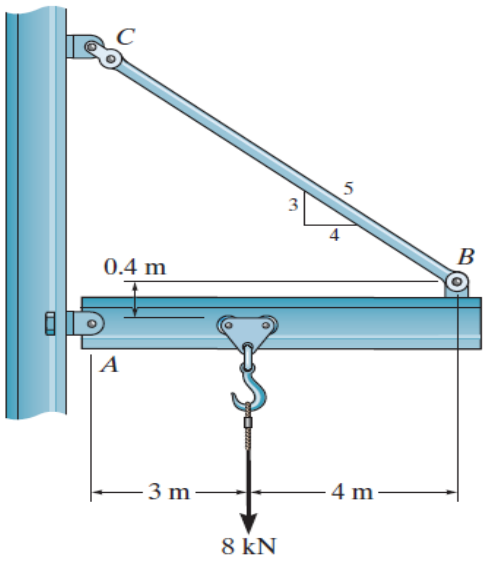
a. Whether the reactions are statically determinate or indeterminate (*8 pts*),

b. Whether the equilibrium statically exist (*8 pts*),

c. The reaction forces if possible. (*8 pts*)



3. In the following figure, find the reaction force at the pin *A* and the tension force at the link *CB* by using the properties of a three – force member. (Other solution methods will not be graded.) (*20 pts*)



4. The 2000-kg crate is supported by a link-and-cable system which is held by a ball-and-socket joint at *A* and by two cables attached at *D* and *E* as shown in the figure. The link *AC* forms an angle θ with the xy – plane and $0 < \theta < 90\,°$. Determine

a. The tension forces $\vec{F}_{BD}$ and $\vec{F}_{BE}$ in terms of θ (*20 pts*),

b. The magnitude of the reaction force at *A* when $\theta = 30\,°$. (*10 pts*)