AEM 2011 Homework #10 (6.3, 6.4, 7.1) Wednesday, March 29, 2023

Unless otherwise mentioned, these problems should be solvable using a basic calculator. Practice clear communication by showing all work (free body diagrams, algebra, etc). This will be required to receive full credit on any graded problems.

1. Book problems:

   (a) 6.75

   (b) 6.93

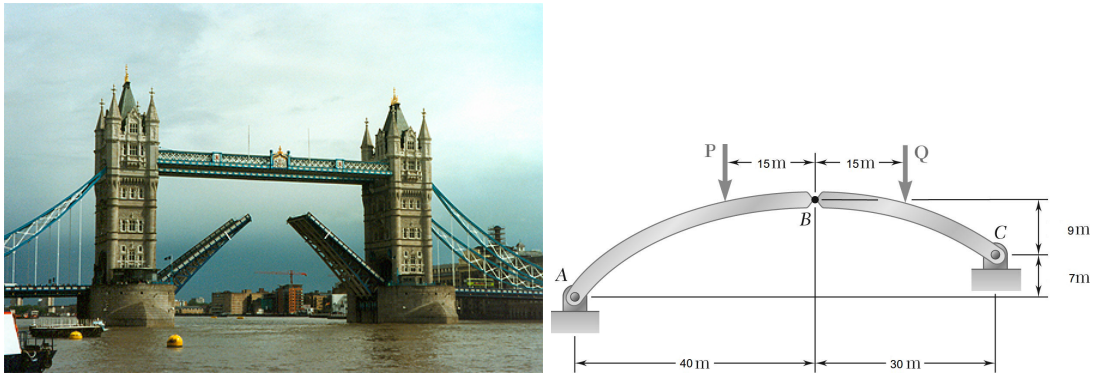
   (c) 6.141

   Additional Practice Problems: 6.79, 6.99, 6.123, 6.143, 7.8, 7.12, 7.26

   The quiz problem will not be selected from these additional practice problems. However, these exercises contain important elements of the course and similar problems may appear on the exam.

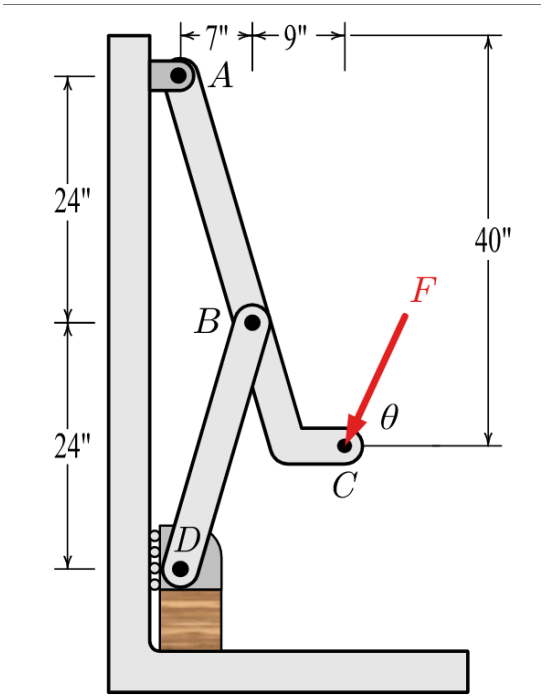
2. A Twin-Leaf Bascule bridge is a bridge where the two leafs (sections) of the bridge can rotate upwards to let the height clearance below the bridge to increase to allow ships to pass below. Consider a parabolic Twin Leaf Bascule bridge as shown below. Assume that in a closed position, the joint between the two leafs is a hinge joint. The axis of the three-hinge arch ABC is a parabola with the vertex at B. Knowing that $P = 700$ kN and $Q = 560$ kN, determine:

   - The components of the reaction at A.
   - The components of the force exerted at B on segment AB.

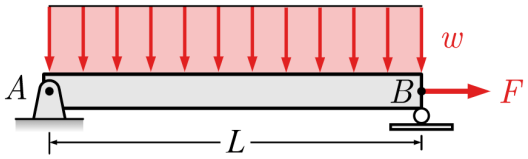


Bascule Bridge (left) Simplified Diagram (right)

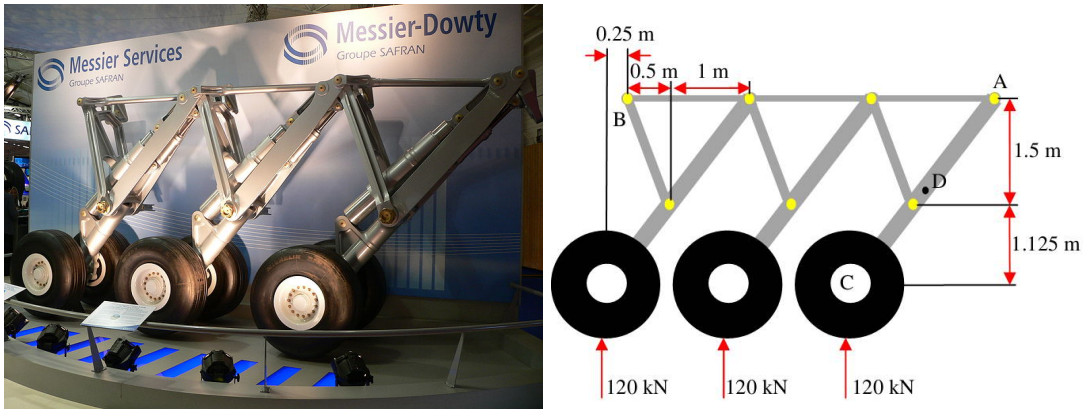
3. A toggle clamp is shown below. Knowing that angle $\theta = 60°$, find the vertical clamping force acting on the piece at D and the magnitude of the force exerted on member ABC at pin B in terms of force F applied to the clamp arm at C.



4. A beam of length L is supported by a pin at A and a roller at B and is subjected to a horizontal force F applied to point B and a uniformly distributed load over its entire length. The intensity of the distributed load is w with units of [force/length].



5. The rear landing gear mechanism from the Airbus A400M military transport aircraft is shown below. The simplified diagram provided shows the external forces acting on the mechanism during the final phase of a landing. Each of the three sections of the mechanism have identical dimensions. The mechanism is connected to the aircraft with a fixed support at point A and a roller support at point B. Determine the internal forces at point D, which is the midpoint of member AC.



A400M Rear Landing Gear (left) Simplified Diagram (right)