

ME 1028 (06-1)

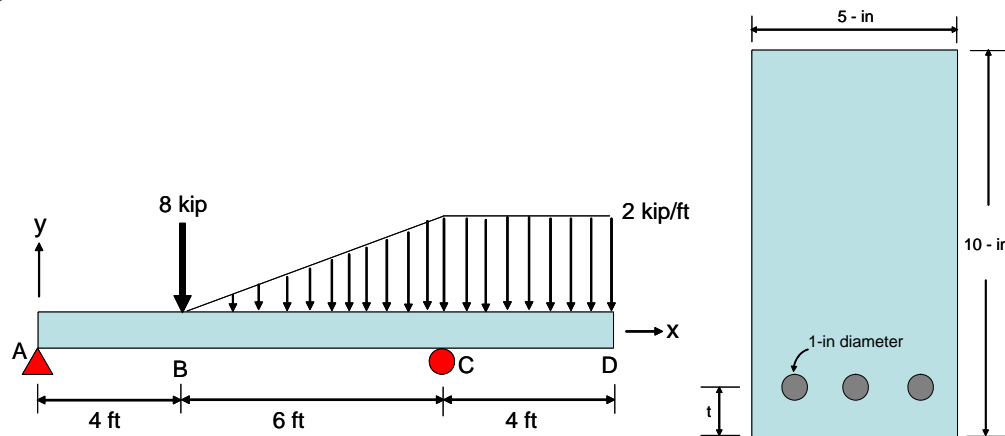
HW#5

Due on Monday, Oct. 17th

Name

(1) For the loading conditions as shown below, a concrete beam of width 5-in and height 10-in is reinforced with three steel rods of diameter of 1-in. The yield strength of steel is 36 ksi with safety factor of 3. $E_s = 30 \times 10^6$ psi and $E_c = 1.5 \times 10^6$ psi.

- (a) Determine the location of the rods (CAE tools are not required for problem (a))
- (b) Write singularity functions of $V(x)$, $M(x)$, $\theta(x)$, and $y(x)$ by using CAE tools (MathCAD, Matlab, Mathematica, or Maple, etc.) (Hand-writing solution will not be accepted)
- (c) Determine shear force, moment, slope and deflection when $x = 5.5$ ft (Hand-writing solution will not be accepted).
- (d) Determine shear force, moment, slope and deflection when $x = 10$ ft (Hand-writing solution will not be accepted)
- (e) Plot $V(x)$ vs. x , $M(x)$ vs. x , $\theta(x)$ vs. x , and $y(x)$ vs. x . (Hand-writing solution will not be accepted)



(2) (CAE tools are not required in this problem)

A simply supported beam of span length 8 ft carries a uniformly distributed load of 2.5 kip/ft. Determine the required thickness t of the steel plates.

Given: The cross section of the beam is a hollow box with wood flanges ($E_w = 1.5 \times 10^6$ psi) and steel ($E_s = 30 \times 10^6$ psi), as shown in figure below.

Assumptions: The allowable stresses are 19 ksi for the steel and 1.1 ksi for the wood.

