# Statics for Engineers
# Spring 2022-2023
# ME 211 & ME 205
# Second Midterm Exam

26.05.2023

Name:
School Number:

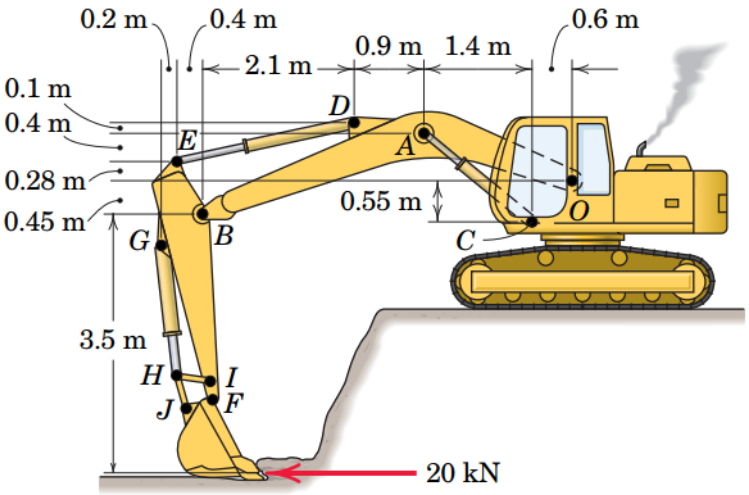
| | Q.1(30P) | Q.2(40P) | Q.3(30P) | TOTAL |
|---|---|---|---|---|
| POINTS | | | | |

1. (**30 POINTS**) In the particular position shown, the excavator applies a $20-kN$ force parallel to the ground. There are two hydraulic cylinders $AC$ to control the arm $OAB$ and a single cylinder $DE$ to control arm $EBIF$. **Draw the necessary Free Body Diagrams for the solution**.

   (a) Determine the force in the hydraulic cylinders $AC$ and the pressure $p_{AC}$ against their pistons, which have an effective diameter of 95 mm.

   (b) Also determine the force in hydraulic cylinder $DE$ and the pressure $p_{DE}$ against its 105-mm-diameter piston. Neglect the weights of the members compared with the effects of the $20-kN$ force.

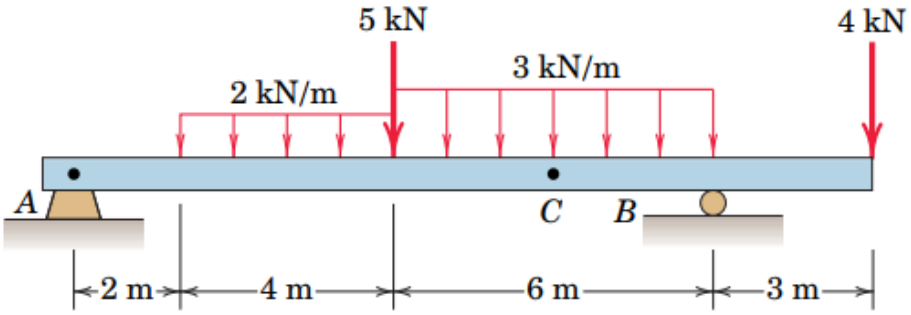
   **Hint: Recall that force = (pressure)(area)**.



2. (**40 POINTS**)

(a) Draw the shear and moment diagrams for the beam subjected to the combination of distributed and point loads.

(b) Determine the values of the shear force and bending moment at point $C$, which lies 3 m to the left of $B$.



3. (**30 POINTS**) The coefficient of static friction between wedges $B$ and $C$ is $\mu_s = 0.55$ and between the surfaces of contact $B$ and $A$ and $C$ and $D$, $\mu_s' = 0.45$. If the spring is compressed 100 mm when in the position shown, determine the smallest force $P$ needed to move wedge $C$ to the left. Neglect the weight of the wedges. **Draw the free body diagram of each relevant component properly**.