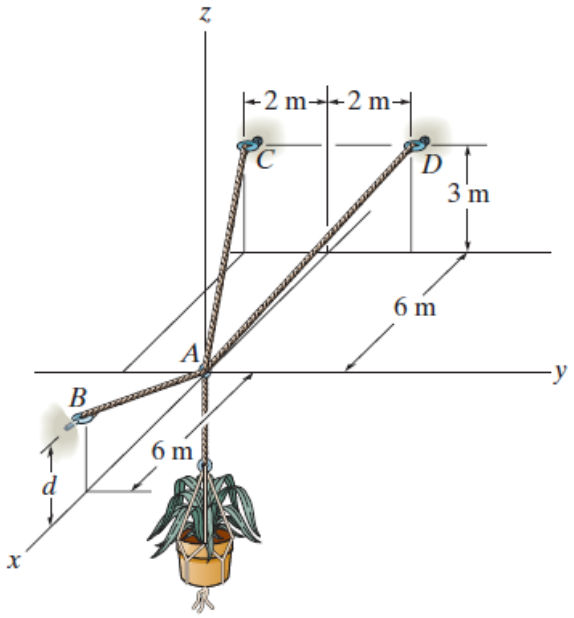
Name – Surname:

No.:

Istanbul Technical University – Faculty of Aeronautics and Astronautics **25.10.2019**
2019-2020 Fall Term
15549 STA201E Statics

Quiz – 4 - SOLUTION

Problem: Determine the height *d* of cable *AB* so that the force in cables *AD* and *AC* is one-half as great as the force in cable *AB* . What is the force in each cable for this case? The flower pot has a mass of 50 kg.



Solution:

The point A is chosen as a particle. Eqs. of equilibrium can be written as follows:

$$\sum F_y = -\frac{2}{7}T_C + \frac{2}{7}T_D = 0 \quad (1)$$
$$\sum F_x = -\frac{6}{7}T_C - \frac{6}{7}T_D + T_{B_x} = 0 \quad (2)$$
$$\sum F_z = \frac{3}{7}T_C + \frac{3}{7}T_D + T_{B_z} = W \quad (3)$$

Additional expressions are needed to solve this set of equations because the number of unknowns (four) is greater then the number of equations (three). [this is also true when T_B and θ (angle of T_B with the x-axis) or T_B and *d* are chosen to express the force in cable AB]

$$\frac{T_{B_z}}{T_{B_x}} = \frac{d}{6}, \quad \frac{|AB|}{6} = \frac{T_B}{T_{B_x}}, \; T_C = T_D = T_B/2 \quad (4)$$

The results for the unknowns become:

$$d = \sqrt{13} \;\; m, \quad T_C = T_D = 260\ N, \quad T_B = 520\ N$$