
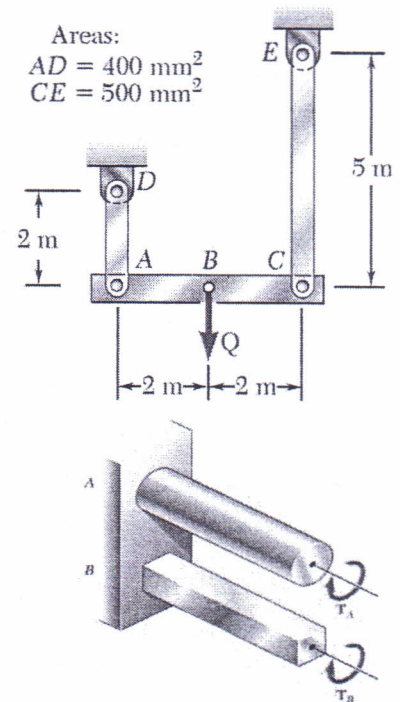


Mansoura University	 1St term Mid-Term Exam	Academic Year 2018/2019
Faculty of Engineering		Course Name: Stress Analysis (PDE281)
Total Grade: 20 marks		Level: (200) Dept.: BME
No. of pages: 1		Time Allowed: 60 min.

### PROBLEM 1:

The rigid beam  $ABC$  is suspended from two steel rods as shown and is initially horizontal. The midpoint  $B$  of the beam is deflected 10 mm downward by the slow application of the force  $Q$ , after which the force is slowly removed. Knowing that the steel used for the rods is elastoplastic with  $E = 200$  GPa and  $\sigma_Y = 300$  MPa, determine (a) the required maximum value of  $Q$  and the corresponding position of the beam and (b) the final position of the beam.



### PROBLEM 2

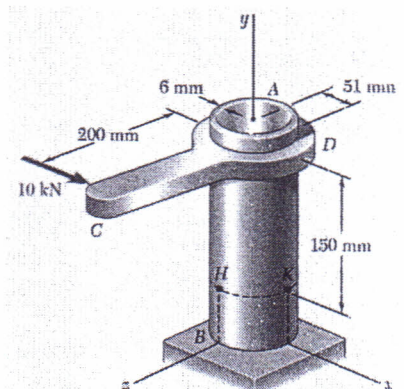
Shafts  $A$  and  $B$  are made of the same material and have the same cross-sectional area, but  $A$  has a circular cross section and  $B$  has a square cross section. Determine the ratio of the maximum torques  $T_A$  and  $T_B$  when the two shafts are subjected to the same maximum shearing stress ( $\tau_A = \tau_B$ ). Assume both deformations to be elastic.

Coefficients for Rectangular Bars in Torsion

$a/b$	$c_1$	$c_2$
1.0	0.208	0.1406
1.2	0.219	0.1661
1.5	0.231	0.1958
2.0	0.246	0.229
2.5	0.258	0.249
3.0	0.267	0.263
4.0	0.282	0.281
5.0	0.291	0.291
10.0	0.312	0.312
$\infty$	0.333	0.333

### PROBLEM 3

The steel pipe  $AB$  has a 102-mm outer diameter and a 6-mm wall thickness. Knowing that arm  $CD$  is rigidly attached to the pipe, determine the principal stresses and the maximum shearing stress at point  $K$ .



Best wishes

Prof. Dr. Abdou Abdel-Samad