

CE 203 STRUCTURAL MECHANICS I

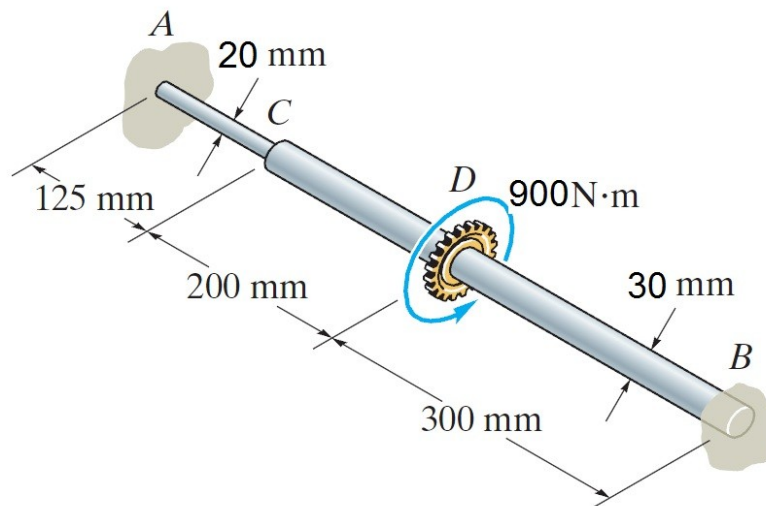
First Semester 2012 / 2013 (121)

HOMEWORK NO. 8

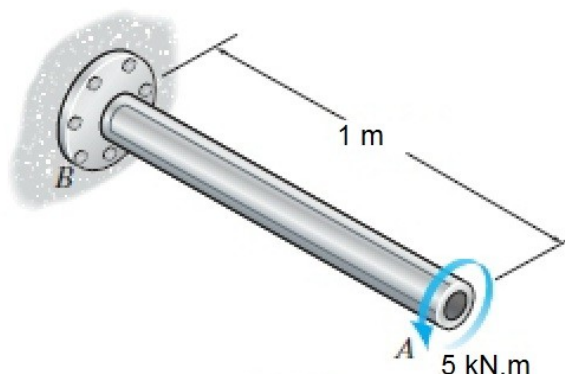
- **Textbook Sections Covered: 5.4 - 5.7** , Torsion : Statically-Indeterminate shafts & Non-circular Sections
- **DUE DATE: Monday, 12 November 2012**

1 – Solve problem 5-62 in the textbook (page 211) using the given revised data: **diameter = 30mm (instead of 25)**. Also, determine the magnitude and location of the maximum stress in the whole shaft.

2- The steel shaft is made from two segments: AC has a diameter of 20 mm, and CB has a diameter of 30 mm. If it is fixed at its ends A and B and subjected to a torque of $900 \text{ N} \cdot \text{m}$, determine the support reactions at A and B. Also, find the angle of twist of point D ($G=100 \text{ GPa}$).



3 - The given **composite** shaft is subjected to the given torque and is fixed at B as shown. The cross section is made of a solid circular steel part (outer radius = 40 mm & $G=100 \text{ GPa}$) which is welded to an Aluminum tube (inner radius = 40 mm , outer radius = 70 mm & $G=30 \text{ GPa}$). Determine and plot the values and distribution of shear stress along the radius of the shaft. Also , determine the angle of twist of point A.



4 – Solve problem 5-101 in the textbook (page 230) using the given revised data: **Allowable stress = 50 MPa (instead of 75) and allowable angle of twist = 0.03 rad (instead of 0.02).**

5- The given cross section is for a shaft subjected to a torque of 10 N.m. Determine the magnitude and location of the maximum shear stress in the whole shaft. Also determine the angle of twist of the shaft end. ($G = 100 \text{ GPa}$, shaft length = 800 mm)

