CE 203 STRUCTURAL MECHANICS I

First Semester 2012 / 2013 (**121**)

HOMEWORK NO. 7

- **Textbook Sections Covered: 5.1 & 5.3 ,** Torsion of circular shafts
- **DUE DATE: Monday, 5 November 2012**

1- The solid steel shaft *DF* is supported by smooth bearings at *D* and *E*. It is coupled to a motor at *F*, which delivers 20 kW of power to the shaft while it is turning at 60 rev/sec. If gears *A*, *B*, and *C* remove 5 kW, 7 kW, and 8 kW respectively, determine the maximum shear stress developed in the shaft within regions *CF* and *BC*. The shaft is free to turn in its support bearings *D* and *E*.
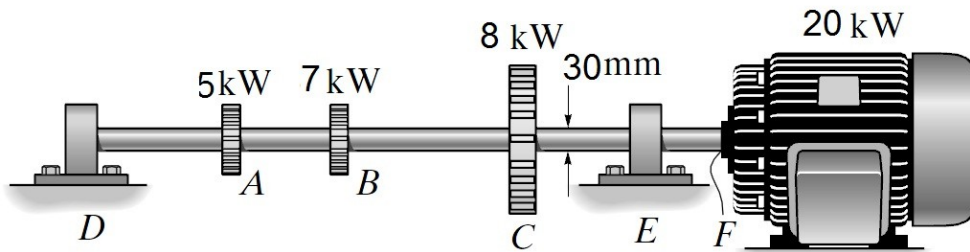
2- The assembly (shown below) consists of a solid rod AB (d=12 mm) connected to the inside of a tube DC using a rigid disk at B. The tube DC has an outer diameter of 40 mm and a thickness of 6 mm. Given that the max allowable stress is 50 MPa determine the largest value of torque T_0 that can be safely applied.
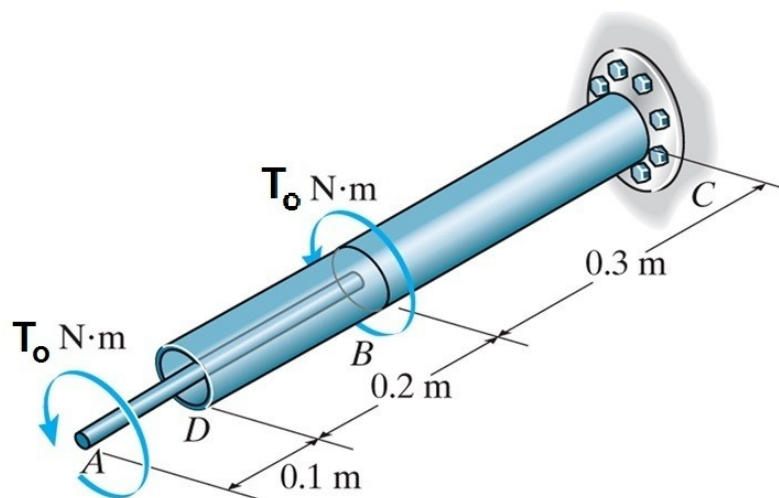
3 - The given hollow circular shaft is subjected to the distributed and concentrated torsional loadings shown. Determine the absolute maximum shear stresses in BC, and the absolute maximum shear stresses in BA. Sketch a diagram for the value of the internal torque T_R along axis CA. (outer radius = 50 mm , inner radius = 30 mm)

1 kN·m/m

4 m

1800 N·m

B

1.5 m

C

A