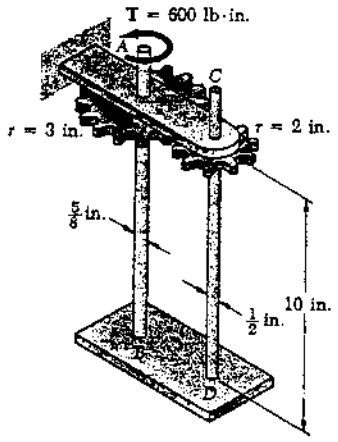
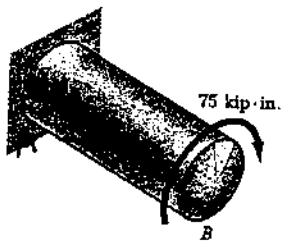
1. (30pts) Please define the following terms:
   (a) yield strength at 0.2% strain offset, (b) ductile and brittle materials, (c) stress components under general loading condition, (d) true stress and true strain, (e) volumetric train, (f) plastic torque for circular shaft, (g) neutral surface of a beam, (h) method of transformed section for composite beam, (i) shear center, (j) von Mises yield criterion.

2. (30pts) Two solid aluminum shafts ($G = 3.7 \times 10^6$ psi) are connected by the gears shown. Knowing that ends B and D are fixed, determine for the given loading (a) the maximum shearing stress in shaft CD, (b) the angle through which end C rotates.



3. (20pts) A 75-kip·in. torque is applied to the end of a tank containing oil under a pressure of 400 psi. knowing that the tank has a 10-in. outside diameter and a 1/4-in. wall thickness, determine the maximum normal stress and maximum shearing stress in the cylindrical wall of the tank.



4. (20pts) For the beam and loading shown, determine (a) the value of *a* for which the slope at end A is zero, (b) the corresponding deflection at point C.