SME 3523 Tutorial #1
Jan 2009

1. Sketch free-body diagrams for sphere *A*, sphere *B*, and the container, shown in Figure 1. Also, determine the magnitude of the forces acting on sphere *A*, sphere *B*, and the container.

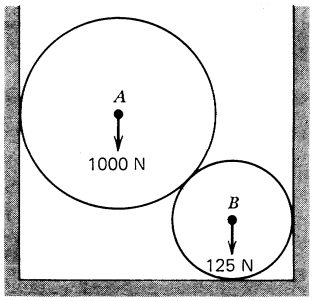

Figure 1

2. Draw the free-body diagram for the pinned assembly shown in Figure 2. Find the magnitude of the forces acting on each member of the assembly.

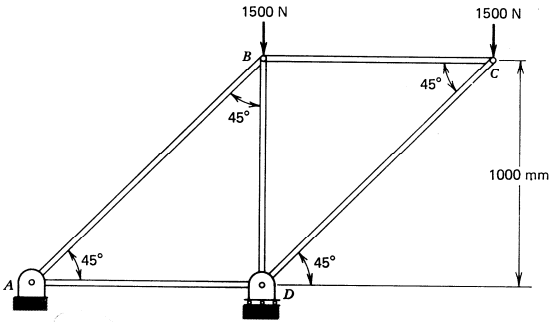

Figure 2

3. The drawing (Figure 3) shows an electric fan supported by mountings at *A* and *B*. The motor delivers a torque of 2 N·m to the fan blades. They, in turn, push the air forward with a force of 20 N. Neglecting gravity forces, determine all loads acting on the fan (complete assembly). Sketch it as a free body in equilibrium.

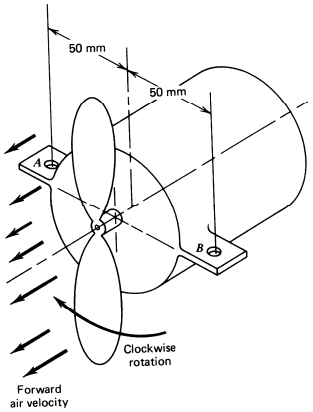

Figure 3

4. The drawing (Figure 4) represents a bicycle with an 800-N rider applying full weight to one pedal. Treat this as a two-dimensional problem, with all components in the plane of the paper. Draw as free bodies in equilibrium
    a. The pedal, crank, and pedal sprocket assembly.
    b. The rear wheel and sprocket assembly.
    c. The front wheel assembly.

d. The front wheel.
e. The entire bicycle and rider assembly.

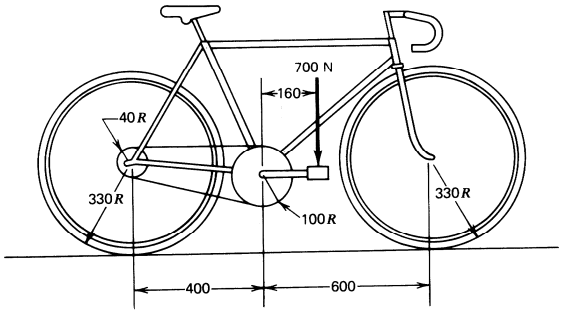

Figure 4

5. Draw a free-body diagram for the gear and shaft assembly shown in Figure 5. Also, sketch free-body diagrams for gear 1, gear 2, and the shaft. Draw shear and bending moment bending diagrams.

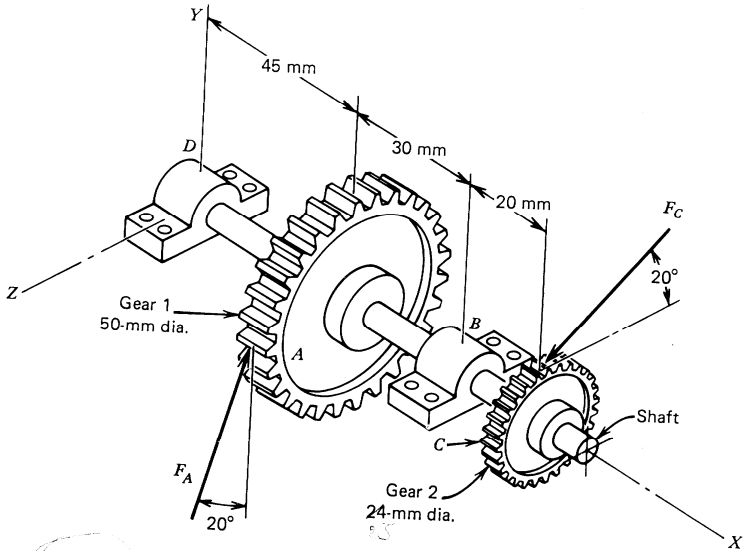

Figure 5

6. The shaft with bevel gear shown in Figure 6 is supported by self aligning bearings *A* and *B*. Only bearing *A* takes thrust. Draw shear and bending moment diagram for the shaft.

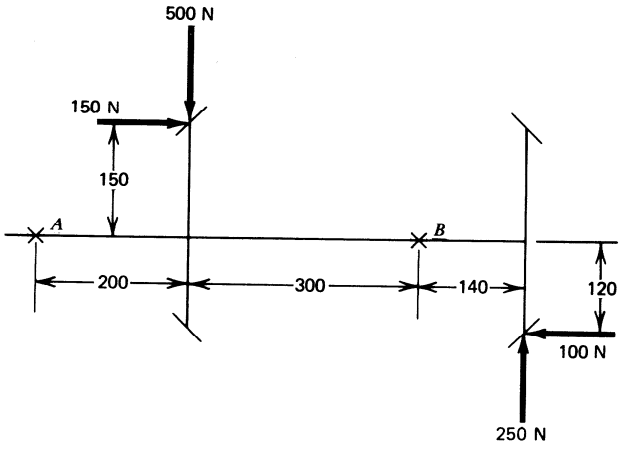

Figure 6