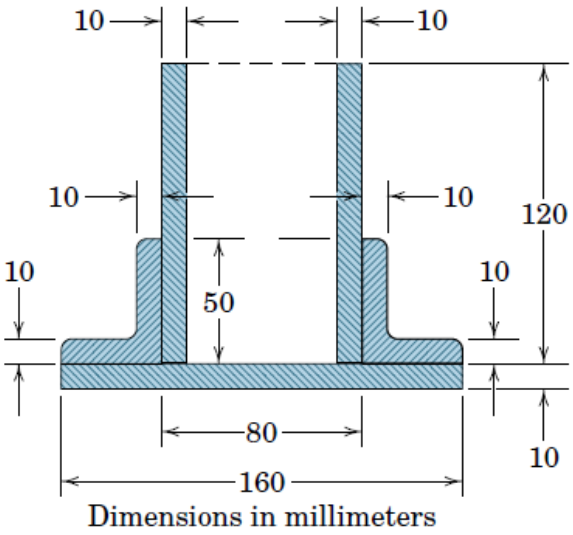
New Problem Sheet No. 5.2

(Centers of Mass and Centroids of Composite Bodies and Figures)

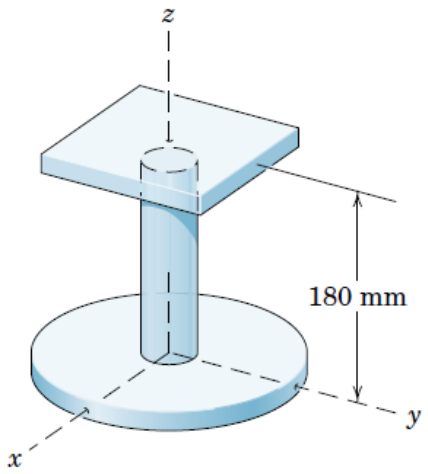
1. Determine the distance $\bar{H}$ from the bottom of the base plate to the centroid of the built-up structural section shown.

   Ans. $\bar{H} = 39.3$ mm



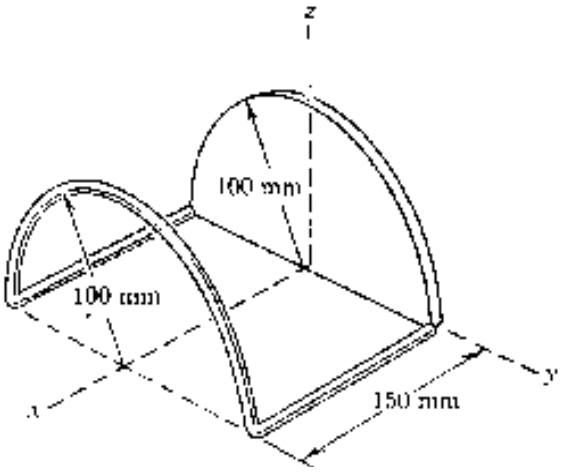
2. The rigidly connected unit consists of a 2-kg circular disk, a 1.5-kg round shaft, and a 1-kg square plate. Determine the z-coordinate of the mass center of the unit.

   Ans. $\bar{Z} = 70$ mm



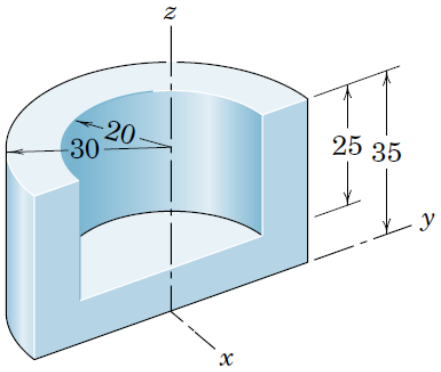
3. The welded assembly is made of a rod which has a mass of 0.5 kg/m of length and the semicircular plate which has a mass of 30 kg/m2 of surface area. Calculate the coordinates of the center of mass of the assembly.

   Ans. $\bar{X} = 44.7$ mm, $\bar{Y} = 0$, $\bar{Z} = 38.5$ mm



4. Calculate the coordinates of the mass center of the metal die casting shown.

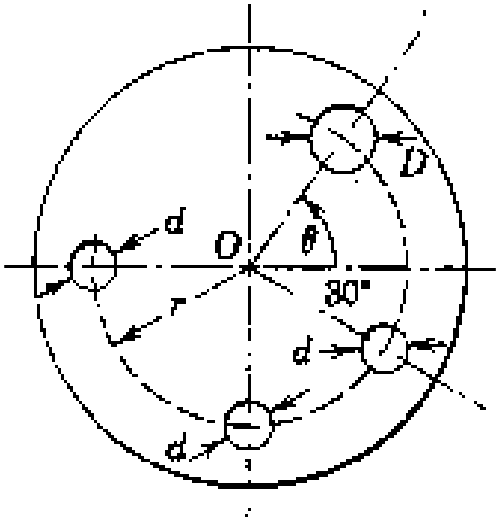
Ans. $\bar{X}$ = -14.71 mm, $\bar{Z}$ = 15.17 mm



Dimensions in millimeters

5. The circular disk rotates about an axis through its center o and has three holes of diameter d positioned as shown. A fourth hole is to be drilled in the disk at the same radius r so that the disk will be in balance (mass center at O). Determine the required diameter D of the new hole and its angular position.

Ans. D = 1.227d, θ = 84.9^0



6. A cylindrical container with an extended rectangular back and semicircular ends is all fabricated from the same sheet-metal stock. Calculate the angle □ made by the back with the vertical when the container rests in an equilibrium position on a horizontal surface.

Ans. α = 39.6^0