1. A vertical square area 8 by 8 m is submerged in water with upper edge 4 m below the surface. Locate a horizontal line on the surface of the square such that
    (a) the force (N) on the upper portion equal the force on the lower portion and (10%)
    (b) the moment (m•N) of force about the line due to the upper portion equals the moment due to the lower portion. (10%)

2. For highly turbulent flow the velocity distribution in a pipe is given by

$$\frac{v}{v_{max}} = \left(\frac{y}{r_0}\right)^{1/9}$$

   With y the wall distance and r_0 the pipe radius. Determine the kinetic-correction factor for this flow. (20%)

3. Please work out the scaling ratio for torque T on a disk of radiu r that rotates in fluid of viscosity μ with angular velocity ω and clearance y between disk and fixed plate. (20%)

4. Calculate both depth and velocity of flow of 100 m^3/s in a gravel trapezoidal channel (n=0.029) with a bottom width of 4 m, side slopes of 3 horizontal to 1 vertical, and a bottom slope of 0.001. (20%)

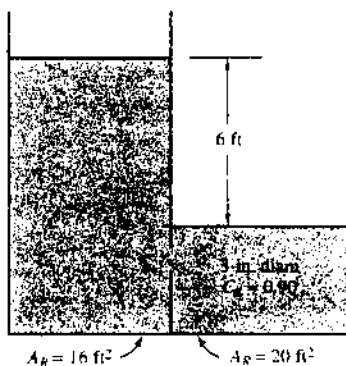5. Determine the time required o raise the right-hand surface of Fig. 5 by 1 ft. (20%)

Fig. 5