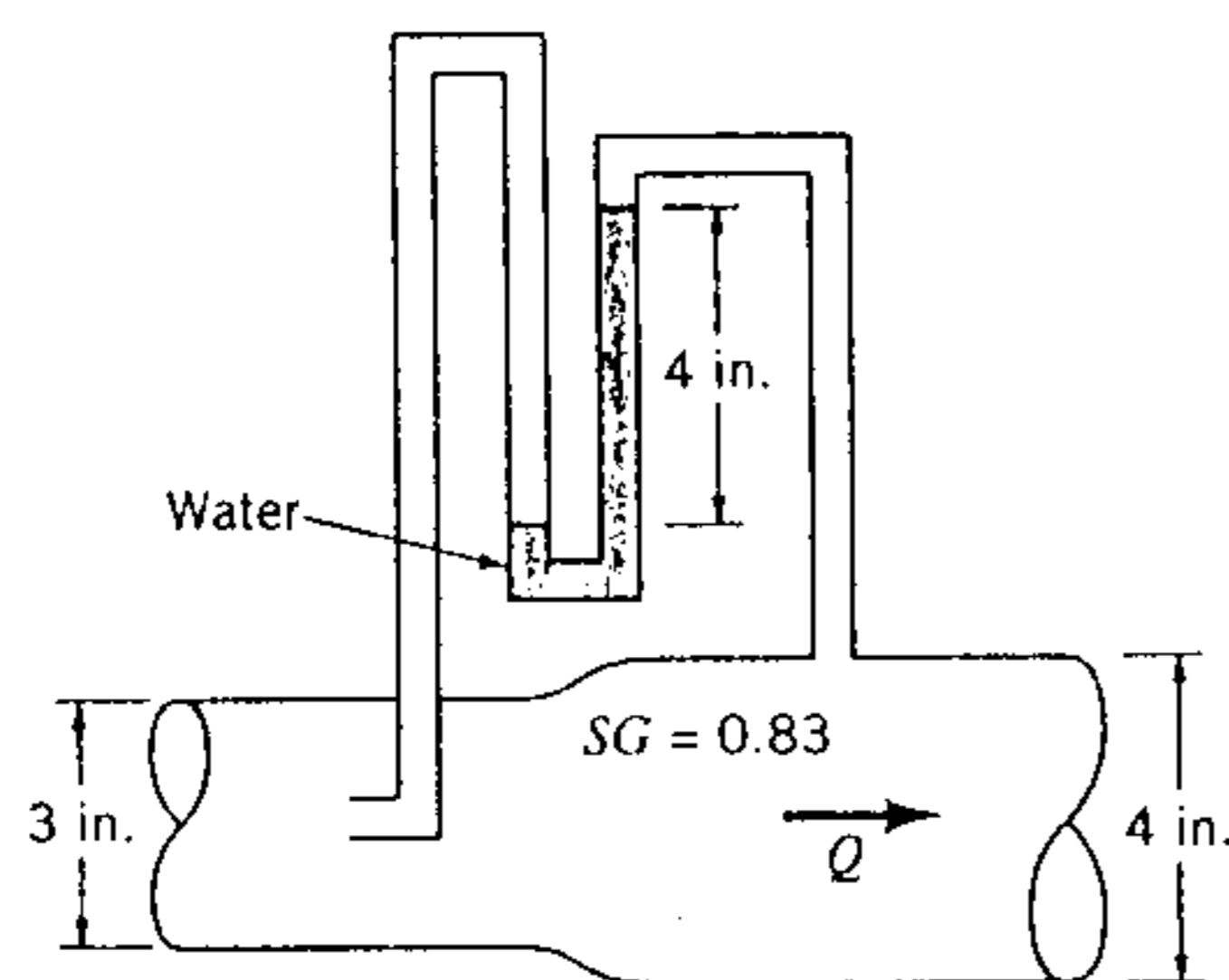


(1) A square gate (4 m by 4 m) is located on the 45 degrees face of a dam. The top edge of the gate lies 8 m below the water surface. Determine the force of the water on the gate and the point through which it acts. 25%

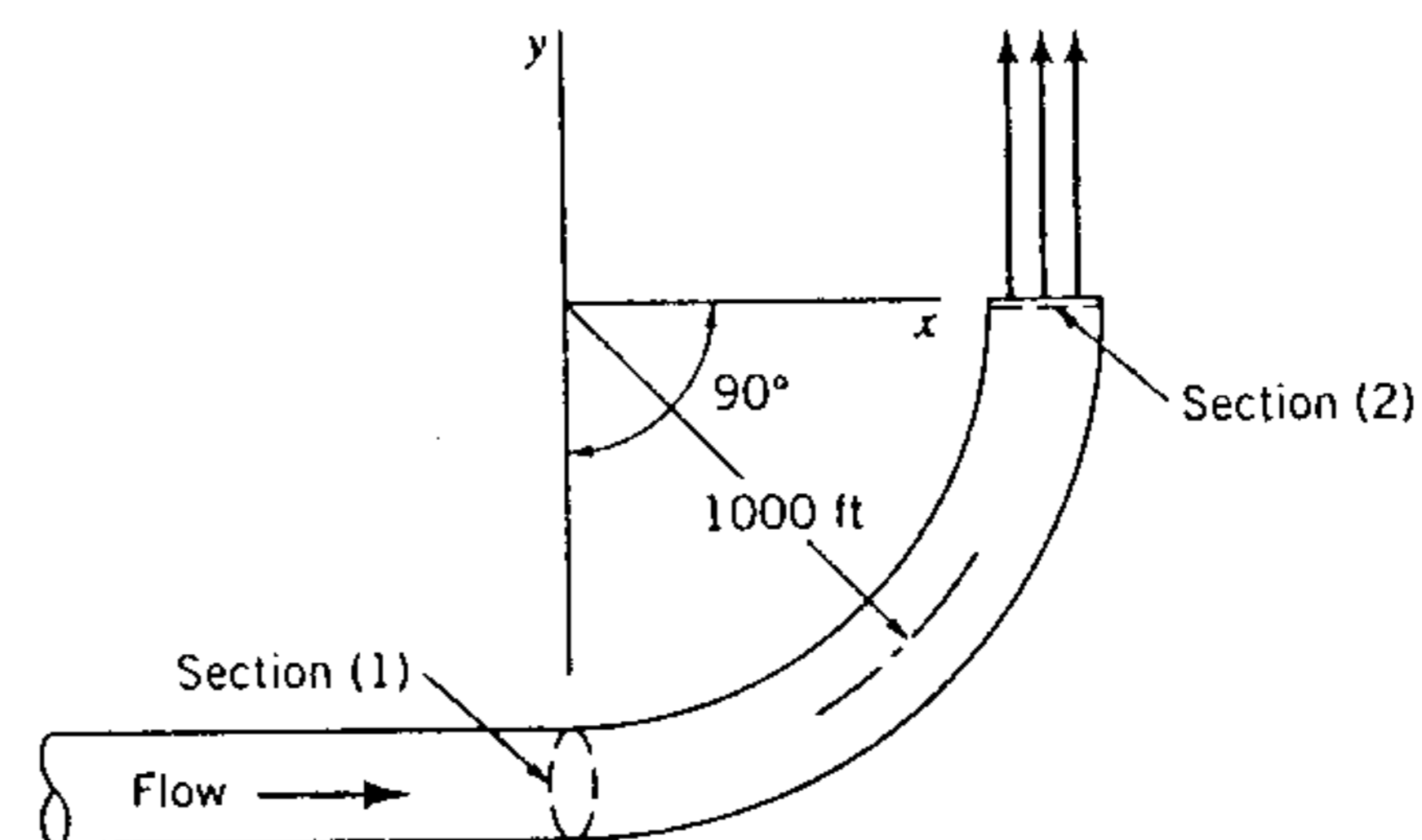
(2) Oil of specific gravity 0.83 flows in the pipe shown in Fig. 1. If viscous effects are neglected, what is the flowrate? 25%

(3) Water flows through a 2-ft diameter pipe arranged horizontally in a circular arc as shown in Fig. 2. If the pipe discharges to the atmosphere ($p=14.7$ psia), determine the x and y components of the resultant force needed to hold the piping between sections (1) and (2) stationary. The steady flow rate is $3000 \text{ ft}^3/\text{min}$. The loss is pressure due to fluid friction between sections (1) and (2) is 25 psi. 25%

(4) An open channel with a rectangular cross section has a width of 20 ft and carries water at a depth of 3 ft at a flowrate of $60 \text{ ft}^3/\text{s}$. A model is to be designed, so that the discharge scale is $1/1024$. At what depth and flowrate would the model operate? 25%



■ FIGURE 1



■ FIGURE 2