

## Problem 1.22

[Difficulty: 1]

**1.22** Express the following in SI units:

- (a) 5 acre · ft
- (b) 150 in<sup>3</sup>/s
- (c) 3 gpm
- (d) 3 mph/s

**Given:** Quantities in English Engineering (or customary) units.

**Find:** Quantities in SI units.

**Solution:** Use Table G.2 and other sources (e.g., Machinery's Handbook, Mark's Standard Handbook)

$$(a) \quad 3.7 \cdot \text{acre} \cdot \text{ft} = 3.7 \cdot \text{acre} \times \frac{4047 \cdot \text{m}^2}{1 \cdot \text{acre}} \times \frac{0.3048 \cdot \text{m}}{1 \cdot \text{ft}} = 4.56 \times 10^3 \cdot \text{m}^3$$

$$(b) \quad 150 \cdot \frac{\text{in}^3}{\text{s}} = 150 \cdot \frac{\text{in}^3}{\text{s}} \times \left( \frac{0.0254 \cdot \text{m}}{1 \cdot \text{in}} \right)^3 = 0.00246 \cdot \frac{\text{m}^3}{\text{s}}$$

$$(c) \quad 3 \cdot \text{gpm} = 3 \cdot \frac{\text{gal}}{\text{min}} \times \frac{231 \cdot \text{in}^3}{1 \cdot \text{gal}} \times \left( \frac{0.0254 \cdot \text{m}}{1 \cdot \text{in}} \right)^3 \cdot \frac{1 \cdot \text{min}}{60 \cdot \text{s}} = 0.000189 \cdot \frac{\text{m}^3}{\text{s}}$$

$$(d) \quad 3 \cdot \frac{\text{mph}}{\text{s}} = 3 \cdot \frac{\text{mile}}{\text{hr} \cdot \text{s}} \times \frac{1609 \cdot \text{m}}{1 \cdot \text{mile}} \times \frac{1 \cdot \text{hr}}{3600 \cdot \text{s}} = 1.34 \cdot \frac{\text{m}}{\text{s}^2}$$