

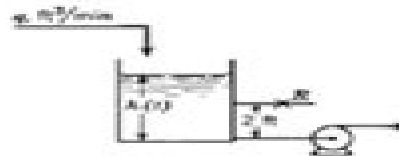
Solutions to Chapter 5 Problems

5.1 Derive the transfer function $H(s) / Q(s)$ for the liquid-level system of Fig. P5.1 when

a) The tank level operates about the steady-state value of $h_s = 1$ ft

b) The tank level operates about the steady-state value of $h_s = 3$ ft.

The pump removes water at a constant rate of 10 cfm (cubic feet per minute); this rate is independent of head. The cross-sectional area of the tank is 1.0 ft^2 and the resistance R is 0.5 ft/cfm .



a) Volume balance : $q - 10 = A \frac{dh}{dt}$

The tank level operates about the steady state value of $h_s = 1$ ft (at this height the only outlet from the tank is through the pump)

at steady state : $q_s - 10 = 0$

after subtraction : $q - q_s = A \frac{dh}{dt}$

$$Q(s) = A \frac{dH}{dt}$$

Taking the transform : $Q(s) = AsH(s)$

Rearranging : $\boxed{\frac{H(s)}{Q(s)} = \frac{1}{As} = \frac{1}{s}}$

b) The tank level operates about the steady state value of $h_s = 3$ ft (at this height the outlets from the tank is through the pump and through the resistance)

Volume Balance : $q - 10 - \frac{(h - 2)}{R} = A \frac{dh}{dt}$

Chapter 5 Solutions Liquidram

Shasha Hu



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Chapter 5 Solutions Liquidram Book Review: Unveiling the Magic of Language

In a digital era where connections and knowledge reign supreme, the enchanting power of language has become more apparent than ever. Its power to stir emotions, provoke thought, and instigate transformation is truly remarkable. This extraordinary book, aptly titled "**Chapter 5 Solutions Liquidram**," compiled by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound impact on our existence. Throughout this critique, we shall delve in to the book is central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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