





balance eqⁿs

tank 1

$$q_i - q_1 = A_1 \frac{dh_1}{dt} \quad (i)$$

tank 2

$$q_1 - q_2 = A_2 \frac{dh_2}{dt} \quad (ii)$$

tank 3

$$q_2 - q_o = A_3 \frac{dh}{dt} \quad (iii)$$

$$\left[q_1 = \frac{h_1}{R_1} \quad q_2 = \frac{h_2}{R_2} \quad q_o = b \right]$$

by eq 1 $q_i - \frac{h_1}{R_1} = A_1 \frac{dh_1}{dt}$

by eq 2 $\frac{h_1}{R_1} - \frac{h_2}{R_2} = A_2 \frac{dh_2}{dt}$

by eq 3 $\frac{h_2}{R_2} - b = A_3 \frac{dh}{dt}$

~~fixed~~ height
of tank 3

Notes

Steady state eqn's

by 1

$$q_s - \frac{h_{1s}}{R_1} = A_1 \frac{dh_{1s}}{dt}$$

$$\frac{h_{1s}}{R_1} - \frac{h_{2s}}{R_2} = A_2 \frac{dh_{2s}}{dt}$$

$$\frac{h_{2s}}{R_2} - b = 0$$

in terms of ~~deviations~~ deviations

$$Q - \frac{H}{R_1} = A_1 \frac{dH_1}{dt} \quad (4)$$

$$\frac{H_1}{R_1} - \frac{H_2}{R_2} = A_2 \frac{dH_2}{dt} \quad (5)$$

$$\frac{H_2}{R_2} = A_3 \frac{dH}{dt} \quad (6)$$

SUNDAY 12

Notes

$$Q = q - q_s \quad (\text{change})$$

$$H_1 = h_1 - h_{1s}$$

$$H_2 = h_2 - h_{2s}$$

$$H = h - h_s$$

Think big and act big to gain the greater rewards in life.

taking laplace of 4, 5, 6

$$Q(s) - H_1(s) = A_1 s H_1(s) \quad (7)$$

$$H_1(s) = \frac{H_2(s)}{R_2} = A_2 s H_2(s) \quad (8)$$

$$H_2(s) = A_3 s H(s) \quad (9)$$

3 eqⁿ 4 unknown

3.00

from 9 $H(s) = \frac{H_2(s)}{R_2 A_3 s}$

4.00

from 8 $H_2(s) = \frac{H_1(s)}{R_1} \left[\frac{R_2}{A_2 R_2 s + 1} \right]$

5.00

Notes

from 7 $H_1(s) = \frac{Q(s) R_1}{(A_1 R_1 s + 1)}$

Those who believe they can t, cannot.



9.00

$$M = \frac{1}{R_2 A_3 s} \left[\frac{R_2}{R_1 (A_2 R_2 s + 1)} \right] \left[\frac{R_1}{(A_1 R_1 s + 1)} \right] \times Q(s)$$

10.00

11.00

$$M(s) = \frac{Q(s)}{(A_3 s) (A_2 R_2 s + 1) (A_1 R_1 s + 1)} \quad \checkmark$$

12.00

1.00

$$\tau_1 = A_1 R_1$$

2.00

$$\tau_2 = A_2 R_2$$

3.00

$$M(s) = \frac{Q(s)}{A_3 s (\tau_1 s + 1) (\tau_2 s + 1)}$$

4.00

10.00

11.00

12.00

1.00

2.00

3.00

