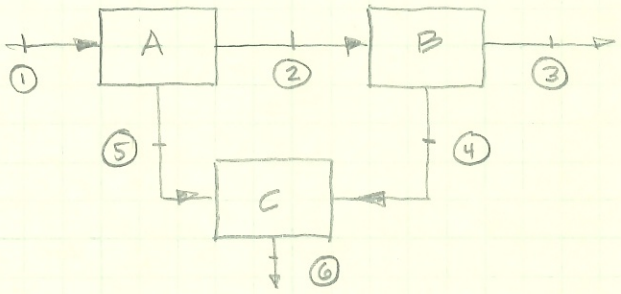
Known: SYSTEM of TANKS @ STEADY-STATE

Find: (a) UNKNOWN FLOW RATES (lbm/s)
(b) IF YOU COULD SOLVE W/ ONLY 2 FLOW RATES GIVEN.
· MAX NUMBER of UNKNOWN FLOWS YOU COULD SOLVE FOR.

Given:

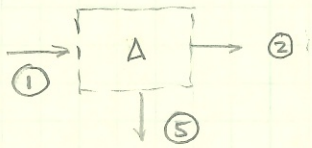


$\dot{m}_1 = 15$ lb/s
$\dot{m}_3 = 20$ "
$\dot{m}_5 = -12$ lbm/s

STEADY-STATE.

Analysis: APPLY CONSV. of MASS TO VARIOUS TANK(S)

(2) FOR TANK A:

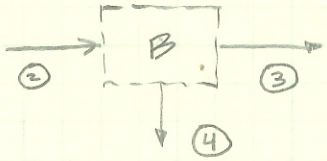


$$\frac{dm}{dt} = \sum_{in} \dot{m} - \sum_{out} \dot{m}$$

$$0 = \dot{m}_1 - \dot{m}_2 - \dot{m}_5$$

$$\dot{m}_2 = \dot{m}_1 - \dot{m}_5 = (15+12) = \boxed{27 \text{ lbm/s}}$$

FOR TANK B:



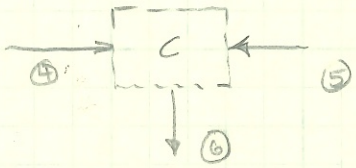
$$\frac{dm}{dt} = \sum_{in} \dot{m} - \sum \dot{m}_{out}$$

0 (S-S)

$$0 = \dot{m}_2 - \dot{m}_3 - \dot{m}_4$$

$$\dot{m}_4 = \dot{m}_2 - \dot{m}_3 = (27-20) = \boxed{7 \text{ lbm/s}}$$

FOR TANK C:



$$\frac{dm}{dt} = \sum \dot{m}_{in} - \sum \dot{m}_{out}$$

0 (S-S)

$$\dot{m}_4 + \dot{m}_5 - \dot{m}_6 = 0$$

$$\dot{m}_6 = \dot{m}_4 + \dot{m}_5 = 7 - 12 = \boxed{-5 \text{ lbm/s}}$$

(b) YOU COULD NOT HAVE SOLVED THIS W/ ONLY 2 FLOW RATES. GIVEN, THE MAX NUM. of UNKNOWNS IS 3, ON FOR EACH CONSERVATION of MASS EQUATION YOU CAN WRITE.

COMMENTS: CONS. of MASS DOESN'T HAVE TO BE WRITTEN FOR EACH TANK - IT CAN BE WRITTEN FOR ANY COMBINATION of 2 TANKS AND/OR ALL 3. HOWEVER, A MAX. of ONLY 3 INDEPENDENT EQUATIONS WILL RESULT.