

18/ENG03/009

AHMED ABDALLAH IDRES

CIVIL ENG

1) 1200 gal of water \rightarrow initial aggregation
50 lb of salt

50 gal of brine (salt & water) \rightarrow inlet
(1 + sint) lb

30 gal per min \rightarrow out

Using balance law

$$\left(\text{Accumulation rate of Salt within a system} \right) = \left(\text{Inlet rate of Salt into the system} \right) - \left(\text{Output rate of Salt within the system} \right)$$

$$\text{Therefore } \frac{dm}{dt} = m_{in} - m_{out}$$

$$m_{in} = \frac{50 \text{ gal}}{\text{min}} \times \frac{(1 + \sin t) \text{ lb}}{\text{gal}} = 50 (1 + \sin t) \frac{\text{lb}}{\text{min}}$$

$$m_{out} = \frac{30 \text{ gal}}{1200 \text{ gal}} = 0.025 = 2.5\% \text{ of } m$$

$$\frac{dm}{dt} \times \frac{\text{lb}}{\text{min}} = 50 (1 + \sin t) \frac{\text{lb}}{\text{min}} = 2.5\% \text{ of } m \frac{\text{lb}}{\text{min}}$$

$$\frac{dm}{dt} = 50 (1 + \sin t) - 0.025m$$

Collects -0.025 from the eqn.

$$\therefore 0.025m + 50 (1 + \sin t)$$

$$= -0.025 \left(\frac{-0.025m + 50 (1 + \sin t)}{-0.025} \right)$$

$$\therefore \frac{dm}{dt} = -0.025 (m - 2000 (1 + \sin t))$$

dm

Cross multiply

$$(m-20) \therefore dm = -0.025 (m-2000) (1+\sin t) dt$$

Divide by $(m-2000) (1+\sin t)$.