## ATUMA JANMA DAVID

## **MECHATRONICS ENGINEERING**

## 18/ENG05/012

## ENG 282

1. The tank contains 1200gal of water with dissolved salt 30gal of the solution exits the tank per minute; 30gal/1200gal = 0.025 = 2.5% Amount of salt present at any time 't' be 'y' Time rate of change at 'y' = dy/dt = y<sub>in</sub> = y<sub>out</sub> If 50gal of brine enters the tank per minute & 1gal contains (1+sint)lb of salt, then 't' = 1 (1 usint) = (1 usint) = 1.02lb

then 't' = 1, (1+sint) = (1+sin1) = 1.02lb

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(i). Amount of salt entering the tank is;
50gal/min x 1.02lb/gal = 51lb/min
y<sub>out</sub> = 2.5% of y
(dy/dt).(lb/min) = 51lb/min - 2.5y. (lb/min)
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(ii). dy/dt = 51 - 0.025y, dy/dt = -0.025y + 51

dy/dt = -0.025. ((-0.025y/-0.025) + (51/-0.025));

dy/dt = -0.025. (y - 2040)

dy/(y-2040) = -0.025dt; \int -0.025dt

\int dy/(y-0.2040) = -0.025t; \int dt;

\ln(y-2040) = -0.025t + c

y-2040 = e^{-0.025t}c;

y-2040 = e^{-0.025t}c;

y-2040 = e^{-0.025t}y_0;

y-2040 = y_0e^{-0.025t}

y = y_0e^{-0.025t} + 2040;
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when t = 1, y= 150lb;

.'.150= y_0 e^{-0.025} + 2040; 150-2040 = y_0 \ge 1

y_0 = -1890

y=-1890e^{-0.025t} + 2040

.'.y= 2040 - 1890e^{-0.025t}
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