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## **DEPT: CHEMICAL ENGINEERING**

## **MATRIC NO: 13/ENG01/008**

## **COURSE: PROCESS DYNAMICS AND CONTROL**

## **COURSE CODE: CHE 531**

## **ASSIGNMENT**

Given that $y(0) = 5$ and $y^{i}(0) = 7$

$$\frac{d^{2}y}{dt^{2}}-3\frac{dy}{dt}+2y=2e^{3t}$$

$$y^{ii}-3y^{i}+2y=2e^{3t}$$

$$\left⌊(S^{2}y\left(s\right)-Sy\left(0\right)-y^{i}(0)\right⌋-3\left⌊Sy\left(s\right)-y\left(0\right)\right⌋+2y(s)= \frac{2}{S-3}$$

$$\left⌊(S^{2}y\left(s\right)-5S-7\right⌋-3\left⌊Sy\left(s\right)-5\right⌋+2y(s)= \frac{2}{S-3}$$

$$\left⌊(S^{2}y\left(s\right)-5S-7\right⌋-3Sy\left(s\right)+15+2y(s)= \frac{2}{S-3}$$

$$S^{2}y\left(s\right)-3Sy\left(s\right)+2y\left(s\right)-5S+8= \frac{2}{S-3}$$

$$y\left(s\right)(S^{2}-3s+2)-5s+8= \frac{2}{S-3}$$

$$y\left(s\right)\left(S^{2}-3s+2\right)= \frac{2}{S-3}-8+5S$$

$$y\left(s\right)\left(S^{2}-3s+2\right)= \frac{2-8(S-3)+5S(S-3)}{S-3}$$

$$y\left(s\right)\left(S^{2}-3s+2\right)= \frac{2-8S+24+5S^{2}-15S}{S-3}$$

$$y\left(s\right)\left(S^{2}-3s+2\right)= \frac{5S^{2}-23S+26}{S-3}$$

$$y\left(s\right)= \frac{5S^{2}-23S+26}{S-3} . \frac{1}{\left(S^{2}-3s+2\right)}$$

$$y\left(s\right)= \frac{(S-2)(5S-13)}{(S-3)(S-1)(S-2)} $$

$$y\left(s\right)= \frac{(5S-13)}{(S-3)(S-1)} $$

$$y\left(s\right)= \frac{(5S-13)}{(S-3)(S-1)}= \frac{A}{(S-3)}+ \frac{B}{(S-1)} $$

$$\frac{(5S-13)}{(S-3)(S-1)}= \frac{A(S-1)+B(S-3)}{(S-3)(S-1)} $$

$$5S-13=A(S-1)+B(S-3)$$

$$5S-13=AS-A+BS-3B$$

$$5S-13=S(A+B)-3B$$

$5=A+B$ (1)

$-13=-A-3B$ (2)

Subtracting equation (2) from (1) we have

$$-8=-2B$$

$$B=\frac{-8}{-2}$$

$$B=4$$

Substituting B in equation (1) we have

$$A+4=5$$

$$A=1$$

$$y\left(s\right)= \frac{(5S-13)}{(S-3)(S-1)}= \frac{1}{(S-3)}+ \frac{4}{(S-1)}$$

$$y\left(t\right)= L^{-i} (y\left(s\right))=L^{-i} \left[\frac{1}{(S-3)}+ \frac{4}{(S-1)}\right]$$

$$y\left(t\right)= e^{3t}+4e^{t}$$