

Name : SOLUTION

1. Use Laplace transform to solve the given initial-value problem.

$$y' + 3y = e^{-t} \quad y(0) = 0$$

$$sY(s) - \underbrace{y(0)}_{=0} + 3Y(s) = \frac{1}{s+1}$$

$$Y(s) [s+3] = \frac{1}{s+1}$$

$$Y(s) = \frac{1}{(s+1)(s+3)}$$

$$\frac{1}{(s+1)(s+3)} = \frac{A}{s+1} + \frac{B}{s+3}$$

$$1 = A(s+3) + B(s+1)$$

$$(I) \quad A + B = 0$$

$$(II) \quad 3A + B = 1$$

$$\left. \begin{array}{l} (I) \quad A + B = 0 \\ (II) \quad 3A + B = 1 \end{array} \right\} \quad (II) - (I) \rightarrow 2A = 1 \Rightarrow A = \frac{1}{2}$$

$$B = -A = -\frac{1}{2}$$

$$Y(s) = \frac{1/2}{s+1} + \frac{-1/2}{s+3}$$

$$y(t) = \frac{1}{2} e^{-t} - \frac{1}{2} e^{-3t}$$