

$$y''(t) - 2y'(t) + y(t) = (2t-3)u(t) \quad \begin{cases} y(0) = 5 \\ y'(0) = 11 \end{cases}$$

$$(s^2 Y(s) - y(0)s - y'(0)) - 2(sY(s) - y(0)) + Y(s) = \frac{2}{s^2} - \frac{3}{s}$$

$$Y(s)(s^2 - 2s + 1) = 5s + 11 - 10 + \frac{2}{s^2} - \frac{3}{s}$$

$$Y(s) = \frac{(5s+1)s^2 + 2 - 3s}{s^2(s-1)^2} = \frac{5s^3 + s^2 - 3s + 2}{s^2(s-1)^2}$$

$$= \frac{A}{s^2} + \frac{B}{s} + \frac{C}{s-1} + \frac{D}{(s-1)^2}$$

$$A = \left. \frac{5s^3 + s^2 - 3s + 2}{(s-1)^2} \right|_{s=0} = \boxed{2 = A}$$

$$D = \left. \frac{5s^3 + s^2 - 3s + 2}{s^2} \right|_{s=1} = \boxed{5 = D}$$

$$Y(s) = \frac{A(s-1)^2 + Bs(s-1)^2 + Cs^2(s-1) + Ds^2}{s^2(s-1)^2}$$

$$(s^3) \quad B + C = 5$$

$$(s) \quad -2A + B = -3 \Rightarrow \boxed{B = 1}$$

$$\Rightarrow \boxed{C = 4}$$

$$Y(s) = \frac{2}{s^2} + \frac{1}{s} + \frac{4}{s-1} + \frac{5}{(s-1)^2}$$

$$y(t) = (2t + 1 + 4e^t + 5te^t)u(t)$$

$$y(0) = 5 \quad \checkmark$$