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15/ENG04/016
Elec / Elect
Assignment 5

① $\frac{dy}{dx} + 3y = e^{-2t}$ given that at $t = 0$, $y = 2$

$y' + 3y = e^{-2t}$

$y = sY(s) - y(0)$

$sY(s) - y(0) + 3Y(s) = \frac{1}{s+2}$

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

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

$sY(s) + 3Y(s) = \frac{2s+5}{s+2}$

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

$Y(s) = \frac{2s+5}{(s+2)(s+3)} = \frac{A}{(s+2)} + \frac{B}{(s+3)}$

$\left.\frac{A}{s+2}\right|_{s=-2} = \frac{2(-2)+5}{-2+3} = \frac{-4+5}{1} = \frac{1}{1} = 1$

$\left.\frac{B}{s+3}\right|_{s=-3} = \frac{2(-3)+5}{-3+2} = \frac{-6+5}{-1} = 1$

$y(t) = L^{-1}\left[\frac{A}{s+2} + \frac{B}{s+3}\right]$

$= L^{-1}\left[\frac{1}{s+2}\right] + L^{-1}\left[\frac{1}{s+3}\right]$

$y(t) = e^{-2t} + e^{-3t}$

$= e^{-2t} + e^{-3t}$

(11) $3\frac{dy}{dt} - 6y = \sin 2t$ at $t = 0$, $y = 1$

$3y' - 6y = \sin 2t$

$3(s^2y(s) - y(0)) - 6y(s) = \frac{2}{s^2+4}$

$3(s^2y(s) - 1) - 6y(s) = \frac{2}{s^2+4}$

$3s^2y(s) - 3 - 6y(s) = \frac{2}{s^2+4}$

$3s^2y(s) - 6y(s) = \frac{2}{s^2+4} + 3$

$3s^2y(s) - 6y(s) = \frac{3s^2+14}{s^2+4}$

$y(s)(3s^2 - 6) = \frac{3s^2+14}{s^2+4}$

$y(s) = \frac{3s^2+14}{(s^2+2)(3s^2-6)}$

$y(s) = \frac{3s^2+14}{(3s^2-6)(s^2+2)^2}$

$y(s) = \frac{3s^2+14}{(3s^2-6)(s^2+2)^2}$

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

$$y(s)(s^2-4s+5) = \frac{3s-5}{s-2}$$

$$y(s) = \frac{3s-5}{(s^2-4s+5)(s-2)} = \frac{A}{s-2} + \frac{Bs+C}{s^2-4s+5}$$

$$s^2-4s+5$$

$$\frac{4 \pm \sqrt{16-20}}{2}$$

$$\frac{4 \pm \sqrt{-4}}{2} = \frac{4 \pm 2j}{2}$$

$$\Rightarrow 2 \pm j$$