$2s - 5 = A(s+2)(s+4) + B(s-3)(s+4) + C(s-3)(s+2)$

At $s = 3$

$1 = 35A$

$A = 1/35$

At $s = -2$

$-9 = -10B$

$B = \frac{9}{10}$

At $s = -4$

$-13 = 14C$

$C = -13/14$

$y(s) = 1/35 \left(\frac{1}{s-3}\right) + 9/10 \left(\frac{1}{s+2}\right) - 13/14 \left(\frac{1}{s+4}\right)$

$y(t) = 1/13 e^{3t} + 9/10 e^{2t} - 13/14 e^{-4t}$

(v) $\frac{d^2y}{dt^2} - 6\frac{dy}{dt} + 8y = e^{3t}$

$s^2y(s) - s\,y(0) - y'(0) - 6s\,y(s) - 6\,y(0) + 8y(s) = \frac{1}{s-3}$

at $t=0$, $y=0$, $y'=2$

$s^2y(s) - 2 - 6s\,y(s) + 8\,y(s) = \frac{1}{s-3}$

$y(s)[s^2 - 6s + 8] = \frac{2s-5}{s-3}$

$y(s) = \frac{2s-5}{(s-3)(s^2-6s+8)}$

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

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

$= \frac{A(s+2)(s+4) + B(s-3)(s+4) + C(s-3)(s+2)}{(s+3)(s+2)(s+4)}$.

when $s = 2$

$1 = -4.76A$

$A = \frac{-1}{4.76} = -0.2 \simeq 0$

when $s = -1.4$

$20.72 = 16.32A$

$A = \frac{20.72}{16.32} = 1.27 \simeq 1$

At $s = 3.4$

$6.32 = 6.72C$

$C = 0.94 \simeq 1$

using approx. values for all decimals.

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

$$y(s) = \frac{1}{s+1}$$

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

Ⓐ $\frac{d^2y}{dt^2} - 2\frac{dy}{dt} + 5y = e^{2t}$

$s^2y(s) - sy(0) - y'(0) - 2[sy(s) - y(0)] - 5y(s) = \frac{1}{s-2}$

At $t=0$, $y=2$, $y'=1$

$s^2y(s) - sy(0) - 1 - 2sy(s) + 4 - 5y(s) = \frac{1}{s-2}$

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

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

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

$$y(s) = \frac{2s^2 - 7s - 7}{(s-2)(s+1.4)(s-3.4)}$$

$$y(s) = \frac{A}{(s-2)} + \frac{B}{(s+1.4)} + \frac{C}{(s-3.4)}$$

$$\Rightarrow \frac{A(s+1.4)(s-3.4) + B(s-2)(s-3.4) + C(s-2)(s+1.4)}{(s-2)(s+1.4)(s-3.4)}$$

$2s^2 - 7s + 7 = A(s+1.4)(s-3.4) + B(s-2)(s-3.4) + C(s-2)(s+1.4)$

$$y(s) = \frac{2s+8}{s(s-4)}$$

$$y(s) = \frac{A}{s} + \frac{B}{s-4}$$

$$= \frac{A(s-4)+Bs}{s(s-4)}$$

$$2s+8 = A(s-4)+Bs$$

when $s = 0$

$8 = -4A$

$A = -2$

when $s = 4$

$16 = 4B$

$B = 4$

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

$$y(t) = -2 + 4e^{4t}$$

$3Ay = 0$

$Ay = 0$

$A = 0$

$\therefore \; y(s) = \frac{13}{4}\left(\frac{1}{3s-6}\right)$

$= \frac{13}{4}\left[\frac{1}{3}\left(\frac{1}{s-2}\right)\right]$

$y(t) = \frac{13}{12} e^{2t}$

(3) $\frac{dy}{dt} - 4y = 8$

$sy(s) - y(0) - 4y(s) = 8/s$

At $t = 0$, $y = 2$

$sy(s) - 2 - 4y(s) = 8/s$

$y(s)(s-4) = \frac{2s+8}{s}$

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

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

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

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

$$3s^2+14 = (Ay+B)(3s-6)+C(s^2+4)$$

when $s=2$

$$26 = 8C$$

$$C = \frac{26}{8} = \frac{13}{4}$$

Comparing coefficients

$$3B = 0$$

$$B = 0$$

$-6s + s = -B$

$B = 1$

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

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

(2) $3\frac{dy}{dt} - 6y = \sin 2t$

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

at $t = 0,\ y = 1$

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

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

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

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

14/ENG04/098

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ENG 381

Assignment V

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

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

at $t=0$, $y=2$

$sy(s) - 2 + 3y(s) = \frac{1}{s+2}$

$y(s)(s+3) = 2(s+2)+1/s+2$

$y(s) = 2s+5/(s+2)(s+3)$

$y(s) = A/s+2 + B/s+3$

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

$2s+5 = A(s+3) + B(s+2)$

when $s = -2$

$A = -4+5$

$A = 1$

when $s = -3$