$3s^2 + 14 = A(s^2+4) + B(8c=6)$

$4A - 6B = 14$

$-6B = 14 - 12$

$B = \frac{1}{3}$

$Y(s) = \dfrac{3}{[3][s-2]} - \dfrac{1}{3(s^2+4)}$

$= e^{2t} - \dfrac{1}{6} \sin 2t$

iii.) $\dfrac{dy}{dt} - 4y = 8$

$Y'(t) - 4Y(s) = 8$

$Y'(t) - 4y(t) = 8$

$sY(s) - Y(0) - 4y(s) = \dfrac{8}{s}$

$(s-4)Y(s) = \dfrac{8}{s} + 2 = \dfrac{8+2s}{s}$

$Y(s) = \dfrac{2s+8}{s(s-4)}$

$\dfrac{2s+8}{s(s-4)} = \dfrac{A}{s} + \dfrac{B}{s-4}$

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

$2(0)+8 = A(0-4) \quad (\therefore A = -2)$

$2(4)+8 = A(4-4) + B(4)$

$B = 4$

$L^{-1}\left[\dfrac{-2}{s} + \dfrac{4}{s-4}\right] = -2 + 4e^{4t}$

iv.) $\dfrac{d^2y}{dt^2} - 2\dfrac{dy}{dt} + 5y = e^{2t}$

$Y''(t) - 2y'(t) + 5y(t) = e^{2t}$

$L[Y''(t)] = s^2 Y(s) - sY(0) - Y'(0)$

$L[Y'(t)] = sY(s) - Y(s)$

$$L[Y(t)] = Y(s)$$

$$s^2 Y(s) - s Y(0) - Y'(0) - 2s Y(s) + 2Y(0) + 5Y(s)$$

$$= \frac{1}{s-2}$$

$$[s^2 - 2s + 5] Y(s) + (2-s)Y_0 - Y'(0) = \frac{1}{s-2}$$

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

$$= \frac{1}{s-2} + 2s - 4 + 1$$

$$= \frac{1}{s-2} + 2s - 3$$

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

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

$$Y(s) = \frac{2s^2 - 7s + 7}{(s-2)(s^2 - 2s + 5)}$$

$$\frac{2s^2 - 7s + 7}{} = \frac{A}{s-2} + \frac{B}{s^2 - 2s + 5}$$

$$2s^2 - 7s + 7 = A(s^2 - 2s + 5) + B(s - 2)$$

$$A = 2$$

$$-2A + B = -7$$

$$B = -7 + 4$$

$$= -3$$

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

$$= 2e^{2t} - \frac{7}{3} + \sin 2t$$

v.) $\dfrac{d^2y}{dt^2} - 6\dfrac{dy}{dt} + 9y = e^{3t}$

$$s^2 Y(s) - s Y(0) - Y'(0) - 6s Y(s) + 6Y(0) +$$

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

$$[s^2 - 6s + 8] Y_{(s)} = 1 + 2 = 1 + 2s - 6$$
$$s = 3$$
$$s - 3$$
$$= \frac{2s - 5}{s - 3}$$

$$Y_{(s)} = \frac{2s - 5}{(s-3)(s-2)(s-4)} = \frac{A}{s-3} + \frac{B}{s-2} + \frac{c}{s-4}$$

$$2s - 5 = A[(s-2)(s-4)] + B[(s-3)(s-4)] + c[(s-3)(s-2)]$$

$$2s - 5 = A(s^2 - 6s + 8) + B(s^2 - 7s + 2) + c(s^2 - 5s + 6)$$

$$2(3) - 5 = A(3-2)(3-4) \implies A = 4$$
$$2(4) - 5 = c(4-3)(4-2) \implies c = 3/2$$
$$- 6A - 7B + 5c = 7$$
$$- 6(-1) - 7B - 5(3/2) = 2$$
$$- 7B = 2 + \frac{15}{2} - 6 = \frac{4 + 15 - 12}{2} = \frac{7}{2}$$

$$\implies B = -1/2$$

$$L^{-1}\left[\frac{-1}{s-3} - \frac{1}{2(s-2)} + \frac{3}{2(s-4)} \right]$$
$$= -e^{3t} - \frac{1}{2}e^{2t} + \frac{3}{2}e^{4t},$$

UDOUSORO, JAMAL. E.
15/ENGO4/058
ELECTRICAL / ELECTRONIC ENGR

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

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

$L[y'(t)] = SY(s) - Y(s)$

$L[y(t)] = Y(s)$

$L^{-1}[e^{-2t}] = \dfrac{1}{s+2}$

$SY(s) - Y(s) + 3Y(s) = \dfrac{1}{s+2}$

$(S-3) Y(s) - 2 = \dfrac{1}{s+2}$

$(s-3)Y(s) = \dfrac{1}{s+2} + 2 = \dfrac{1+2s+4}{s+2} = \dfrac{2s+5}{s+2}$

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

$2(-2)+5 = A(-2-3) \Rightarrow A = \dfrac{1}{-5}$

$2(3)+5 = B(3+2) \Rightarrow B = \dfrac{11}{5}$

$Y(s) = \dfrac{-1}{5(s+2)} + \dfrac{11}{5(s-3)} = \dfrac{-1}{5}e^{-2t} + \dfrac{11}{5}e^{3t}$

ii) $3\dfrac{dy}{dt} - 6y = \sin 2t = 3y'(t) - 6y(t)$

$L[y'(t)] = SY(s) - Y(0)$

$L[y(t)] = Y(s)$

$L[\sin 2t] = \dfrac{2}{s^2+2^2} \quad \to \quad \dfrac{2}{s^2+4}$

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

$Y(s)[3s-6] = \dfrac{2}{s^2+4} + 3 = \dfrac{2+3s^2+12}{s^2+4}$

$= \dfrac{3s^2+14}{s^2+4}$

$Y(s) = \dfrac{3s^2+14}{(3s-6)(s^2+4)} = \dfrac{A}{3s-6} + \dfrac{B}{s^2+4}$