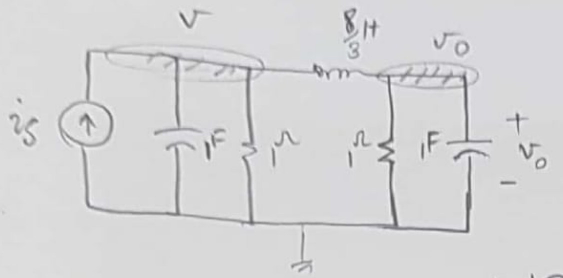


$\times$ KCL @ v_o: $+\frac{dv_o}{dt} + \frac{v_o}{1\Omega} + \frac{3}{8}\int (v_o - v)\,dt = 0$

KCL @ v: $\frac{3}{8}\int (v - v_o)\,dt + \frac{v}{1\Omega} + \frac{dv}{dt} - i_s = 0$

$* \Rightarrow \frac{d^2v_o}{dt^2} + \frac{dv_o}{dt} + \frac{3}{8}v_o - \frac{3}{8}v = 0 \Rightarrow v = \frac{8}{3}\frac{d^2v_o}{dt^2} + \frac{8}{3}\frac{dv_o}{dt} + v_o$

$i_L = \frac{3}{8}\int (v_o - v)\,dt$

$\frac{3}{8}v - \frac{3}{8}v_o + \frac{dv}{dt} + \frac{d^2v}{dt^2} - \frac{di_s}{dt} = 0$ $\quad i_L + v + \frac{dv}{dt} = i_s$

$\Rightarrow \frac{d^2v_o}{dt^2} + \frac{dv_o}{dt} + \cancel{\frac{3}{8}v_o} - \cancel{\frac{3}{8}v_o} + \frac{8}{3}\frac{d^3v_o}{dt^3} + \frac{8}{3}\frac{d^2v_o}{dt^2} + \frac{dv_o}{dt}$

$+ \frac{8}{3}\frac{d^4v_o}{dt^4} + \frac{8}{3}\frac{d^3v_o}{dt^3} + \frac{d^2v_o}{dt^2} = \frac{di_s}{dt}$

$\frac{8}{3}\frac{d^4v_o}{dt^4} + \frac{16}{3}\frac{d^3v_o}{dt^3} + \frac{14}{3}\frac{d^2v_o}{dt^2} + 2\frac{dv_o}{dt} = \frac{di_s}{dt}$

$\Rightarrow \frac{8}{3}\frac{d^3v_o}{dt^3} + \frac{16}{3}\frac{d^2v_o}{dt^2} + \frac{14}{3}\frac{dv_o}{dt} + 2v_o = i_s$

$\Rightarrow 8\frac{d^3v_o}{dt^3} + 16\frac{d^2v_o}{dt^2} + 14\frac{dv_o}{dt} + 6v_o = 3i_s$, $u(t)$

$8s^3 + 16s^2 + 14s + 6 = 0 \Rightarrow s_1 = -1,\ s_{2,3} = -\frac{1}{2} \pm \frac{\sqrt{2}}{2}j$

$v_{op} = K \to 8(0) + 16(0) + 14(0) + 6K = 3 \Rightarrow \boxed{K = \frac{1}{2}}$

$v_o(t) = K_1e^{-t} + e^{-\frac{1}{2}t}\left(K_2\cos\frac{\sqrt{2}}{2}t + K_3\sin\frac{\sqrt{2}}{2}t\right) + \frac{1}{2}$

$v(0^+) = 0$ $\Rightarrow \frac{d^2v_o}{dt^2}(0^+) + \frac{dv_o}{dt}(0^+) + \frac{3}{8}\cancel{v_o(0^+)} - \frac{3}{8}\cancel{v(0^+)} = 0 \Rightarrow \boxed{\frac{d^2v_o}{dt^2}(0^+) = 0}$

$v_o(0^+) = 0 \Rightarrow K_1 + K_2 = -\frac{1}{2}$

$i_L(0^+) = 0 \Rightarrow \frac{dv_o}{dt}(0^+) + v_o(0^+) + i_L(0^+) = 0 \Rightarrow \boxed{\frac{dv_o}{dt}(0^+) = 0}$

$\Rightarrow \begin{cases} K_1 + K_2 = -\frac{1}{2} \\ -K_1 - \frac{1}{2}K_2 + \frac{\sqrt{2}}{2}K_3 = 0 \\ K_1 - \frac{K_2}{4} - \frac{\sqrt{2}}{2}K_3 = 0 \end{cases} \Rightarrow K_1 = -\frac{1}{2},\ K_2 = 0,\ K_3 = -\frac{\sqrt{2}}{2}$

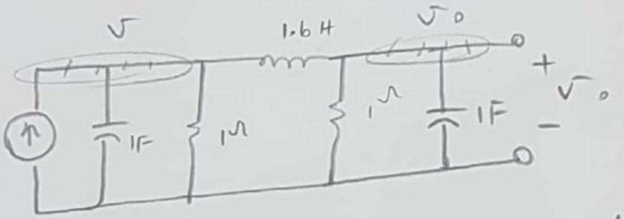
$$v_o(t) = \left(-\frac{1}{2}e^{-t} + e^{-\frac{1}{2}t}\left(-\frac{\sqrt2}{2}\sin\frac{\sqrt2}{2}t\right) + \frac{1}{2}\right)u(t) = s(t)$$

$$h(t) = \frac{ds(t)}{dt} = \left[\frac{1}{2}e^{-t} - \frac{1}{2}e^{-\frac{1}{2}t}\left(-\frac{\sqrt2}{2}\sin\frac{\sqrt2}{2}t\right) + e^{-\frac{1}{2}t}\left(-\frac{2}{4}\cos\frac{\sqrt2}{2}t\right)\right]u(t)$$

$$+\left(\underbrace{-\frac{1}{2}e^{-t} + e^{-\frac{1}{2}t}\left(-\frac{\sqrt2}{2}\sin\frac{\sqrt2}{2}t\right) + \frac{1}{2}}_{-\frac{1}{2}+\frac{1}{2}=0}\right)\underbrace{\delta(t)}_{t=0} \to 0$$

$$\Rightarrow h(t) = \left[\frac{1}{2}e^{-t} + \frac{\sqrt2}{2}e^{-\frac{1}{2}t}\left(\frac{1}{2}\sin\frac{\sqrt2}{2}t - \frac{\sqrt2}{2}\cos\frac{\sqrt2}{2}t\right)\right]u(t)$$

-4



i_s

$$i_s(t) = 2e^{-t}u(t)$$

KCL @ v: $-i_s + \frac{dv}{dt} + v + \frac{10}{16}\int(v - v_o)\,dt = 0$

$$\Rightarrow \frac{d^2v}{dt^2} + \frac{dv}{dt} + \frac{10}{16}v - \frac{10}{16}v_o = \frac{di_s}{dt}$$

KCL @ v_o: $\frac{dv_o}{dt} + v_o + \frac{10}{16}\int(v_o - v)\,dt = 0$

$$\Rightarrow \overset{16/10}{\frac{d^2v_o}{dt}} + \overset{16/10}{\frac{dv_o}{dt}} + \overset{1}{\frac{10}{16}v_o} = \overset{1}{\frac{10}{16}v}$$

$$\Rightarrow \frac{16}{10}\frac{d^4v_o}{dt^4} + \frac{16}{10}\frac{d^3v_o}{dt^3} + \frac{d^2v_o}{dt^2} + \frac{16}{10}\frac{d^3v_o}{dt^3} + \frac{16}{10}\frac{d^2v_o}{dt^2} + \frac{dv_o}{dt} + \frac{d^2v_o}{dt^2} + \frac{dv_o}{dt} + \frac{10}{16}v_o$$

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$$-\frac{10}{16}v_o = \frac{di_s}{dt}$$

$$\underset{8}{\cancel{16}}\frac{d^3v_o}{dt^3} + \underset{16}{\cancel{32}}\frac{d^2v_o}{dt^2} + \underset{18}{\cancel{36}}\frac{dv_o}{dt} + \underset{10}{\cancel{20}}v_o = \underset{5}{\cancel{10}}\,s \to 2e^{-t}$$

$$\Rightarrow 8s^3 + 16s^2 + 18s + 10 = 0 \Rightarrow s_1 = -1,\ s_{2,3} = -\frac{1}{2} \pm j$$

$$v_{op} = Kte^{-t} \Rightarrow v'_{op} = Ke^{-t} - Kte^{-t},\quad v''_{op} = -Ke^{-t} + Kte^{-t} - Ke^{-t}$$

$$v'''_{op} = Ke^{-t} + Ke^{-t} - Kte^{-t} + Ke^{-t}$$

$$8\left(3ke^{-t}-kte^{-t}\right)+16\left(-2ke^{-t}+kte^{-t}\right)+18\left(ke^{-t}-kte^{-t}\right)$$

$$+10kte^{-t}=10e^{-t}$$

$$\underbrace{(\overset{-8}{24-32}+18)\,k\,e^{-t}}_{10ke^{-t}}=10e^{-t}\quad\Rightarrow\quad\boxed{k=1}$$

$$v_o(t)=k_1e^{-t}+e^{-\frac{1}{2}t}\left(k_2\sin t+k_3\cos t\right)+te^{-t}$$

$$v_o(0^+)=0\quad\Rightarrow\quad k_1+k_2=0$$

$$\frac{dv_o}{dt}(0^+)=i_R(0^+)+\underbrace{i_L(0^+)}_{0}=0\quad\Rightarrow\quad k_1=\frac{4}{5},\ k_2=-\frac{4}{5},\ k_3=-\frac{3}{5}$$

$$\frac{16}{10}\frac{d^2v_o}{dt^2}(0^+)+\underbrace{\cancel{\frac{16}{10}\frac{dv_o}{dt}(0^+)}}_{0}+\underbrace{\cancel{v_o(0^+)}}_{0}=\underbrace{\cancel{v(0^+)}}_{0}\quad\Rightarrow\quad\boxed{\frac{d^2v_o}{dt^2}(0^+)=0}$$

$$v_o(t)=\frac{4}{5}e^{-t}+e^{-\frac{1}{2}t}\left(-\frac{4}{5}\sin t-\frac{3}{5}\cos t\right)+te^{-t}$$

$x(t) = e^{-t}u(t) \longrightarrow y(t) = (-e^{-t} + 2e^{-2t})u(t)$

$u(t) \rightarrow s(t) = ?$

$x'(t) = -e^{-t}u(t) + \underbrace{e^{-t}\overset{t=0}{\delta(t)}}_{\delta(t)} \Rightarrow x(t) + x'(t) = \delta(t)$

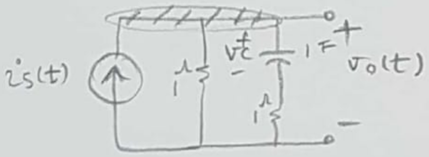
$\Rightarrow h(t) = y(t) + y'(t) \Rightarrow h(t) = (-e^{-t} + 2e^{-2t})u(t) + (e^{-t} - 4e^{-2t})u(t)$

$+ (\underbrace{-e^{-t} + 2e^{-2t}}_{1})\delta(t)$

$\Rightarrow h(t) = -2e^{-2t}u(t) + \delta(t)$

$\Rightarrow s(t) = \int h(t)dt = \int_0^t -2e^{-2t}\overbrace{u(t)}^{1} + \int_0^t \delta(t)\,dt$

$= (-2)(-\frac{1}{2})e^{-2t}\Big|_0^t + \underbrace{u(t)}_{1}\Big|_0^t = e^{-2t} - 1 + 1 = \boxed{e^{-2t}}$ $\underline{\underline{t>0}}$



$-i_s(t) + v_o + v_o - v_C = 0$

$v_o - v_C = \frac{dv_C}{dt} \Rightarrow (D+1)v_C = v_o \Rightarrow v_C = \frac{v_o}{D+1}$

$2v_o - \frac{v_o}{D+1} = i_s \Rightarrow 2(D+1)v_o - v_o = (D+1)i_s$

$\Rightarrow 2\frac{dv_o}{dt} + \cancel{2v_o - v_o}^{\,v_o} = \frac{di_s}{dt} + i_s \rightarrow \delta(t)$

$-e^{-t}\cancel{u(t)} + \underbrace{e^{-t}\overset{t=0}{\delta(t)}}_{\delta(t)} + \cancel{e^{-t}u(t)}$

$2s + 1 = 0 \Rightarrow \boxed{s = -\frac{1}{2}}$

$\hookrightarrow v_o = k_1 e^{-\frac{1}{2}t}u(t)$

$\Rightarrow 2(\overset{-1}{-\frac{1}{2}})k_1 e^{-\frac{1}{2}t}u(t) + \underbrace{2k_1 e^{-\frac{1}{2}t}\delta(t)}_{2k_1\delta(t)} + k_1 e^{-\frac{1}{2}t}u(t) = \delta(t)$

$\boxed{k_1 = \frac{1}{2}}$

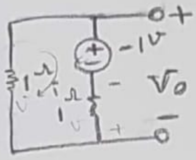
$t = 0^+ \rightarrow$ خازن اتصال کوتاه $\Rightarrow$ $v_o^{(0^+)} = \frac{1}{2}i_s = \frac{1}{2}e^{-t}u(t) = \boxed{\frac{1}{2}}$

$v_o(0^+) = k_1 = \boxed{\frac{1}{2}}$ $\Rightarrow v_o = \frac{1}{2}e^{-\frac{1}{2}t}u(t) \rightarrow$ پاسخ حالت صفر

$$\frac{2dv_o}{dt} + v_o = \frac{di_s}{dt} + i_s^{\,0} \;:\; \text{پاسخ ورودی صفر}$$

$$v_o = Ke^{-t}u(t)$$

$$v_C(0^+) = -1^V \Rightarrow t = 0^+ :$$



$$v_{1\Omega} = -\frac{1}{2}^V \Rightarrow v_o^{(0^+)} = -1-(-\tfrac{1}{2}) = \boxed{-\tfrac{1}{2}^V}$$

$$\Rightarrow v_o(0^+) = \boxed{K = -\tfrac{1}{2}} \qquad \Rightarrow v_o(t) = -\tfrac{1}{2}e^{-t}u(t)$$

پاسخ ورودی صفر

پاسخ کامل هم از مجموع پاسخ ورودی صفر و حالت صفر به دست می‌آید.

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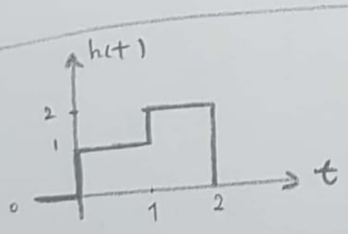
$$h(t) = u(t) - 2u(t-1) + u(t-2)$$

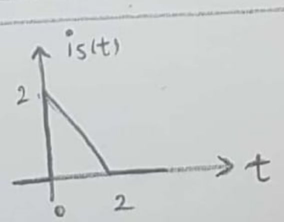
$$i_s(t) = u(t) \quad \Rightarrow \quad s(t) = \int h(t)\,dt$$

$$= \int u(t)dt - 2\int u(t-1)dt + \int u(t-2)\,dt$$

$$\Rightarrow \boxed{s(t) = r(t) - 2r(t-1) + r(t-2)}$$

−30





$$i_s(t) = \begin{cases} 0 & t<0 \\ -t+2 & 0<t<2 \\ 0 & t>2 \end{cases}$$

$$i_s(t) = \qquad \begin{matrix}(0,2)\\(2,0)\end{matrix} \Rightarrow \frac{2-0}{0-2} = -1 \Rightarrow i_s - 0 = -(t-2)$$

$$h(t) = u(t) + u(t-1) - 2u(t-2) = (\delta(t) + \delta(t-1) - 2\delta(t-2)) * u(t)$$

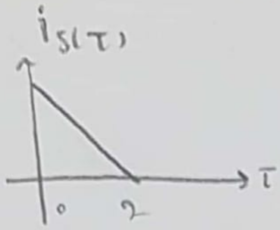
$$i_s(t) = 2u(t) - r(t) + r(t-2) = (2\delta(t) - u(t) + u(t-2)) * u(t)$$

$$v(t) = h(t) * i_s(t) = (\delta(t) + \delta(t-1) - 2\delta(t-2)) * \underbrace{u(t) * (2\delta(t) - u(t) + u(t-2)) * u(t)}_{r(t)}$$

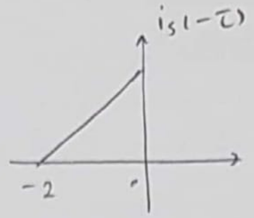
$$\Big[2\delta(t) + 2\delta(t-1) - 4\delta(t-2) - u(t) - u(t-1) + 2u(t-2) + u(t-2) + u(t-3) - 2u(t-4)\Big]$$

$$* \overset{t}{r(t)} = 2r(t) + 2r(t-1) - 4r(t-2) - \tfrac{1}{2}t^2u(t) - \frac{(t-1)^2}{2}u(t-1) + 2\frac{(t-2)^2}{2}u(t-2)$$

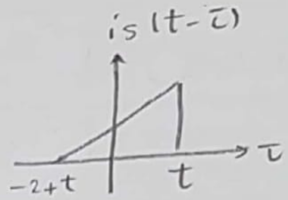
$$+ \frac{(t-2)^2}{2}u(t-2) + \frac{(t-3)^2}{2}u(t-3) - 2\frac{(t-4)^2}{2}u(t-4)$$

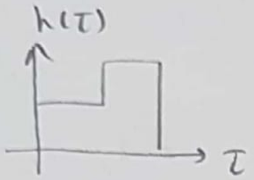


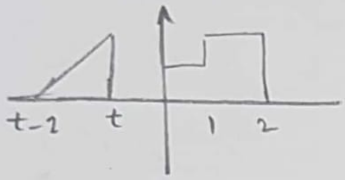
$\Rightarrow$



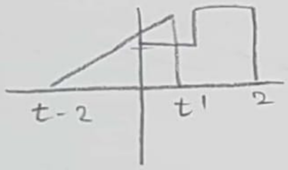
$\Rightarrow$







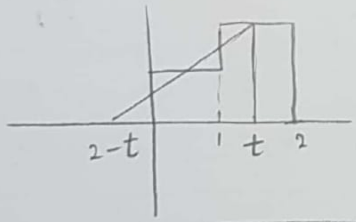
$\Rightarrow \int_0^t h(\tau)\, i_s(t-\tau) = 0 \Rightarrow \boxed{t<0}$



$\Rightarrow \int_0^t (1)(-(t-\tau)+2)\,d\tau =$

$= -t\tau + \frac{1}{2}\tau^2 + 2\tau \Big|_0^t = -t^2 + \frac{1}{2}t^2 + 2t$

$\boxed{0<t<1} \Leftarrow \boxed{= -\frac{t^2}{2} + 2t}$



$\int_1^t (2)(-t+\tau+2)\,d\tau + \int_0^1 (1)(-t+\tau+2)\,d\tau =$

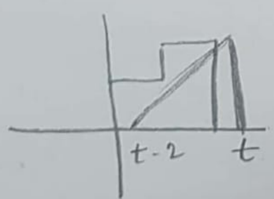
$-2t\tau + \tau^2 + 4\tau \Big|_1^t = -2t^2 + t^2 + 4t + 2t - 1 - 4$

$\boxed{1<t<2} \Leftarrow \boxed{= -t^2 + 6t - 5}$

$= -t\tau + \frac{1}{2}\tau^2 + 2\tau \Big|_0^1 = -t + \frac{1}{2} + 2 = -t + \frac{5}{2}$

$\downarrow$

$\boxed{-t^2 + 5t - \frac{5}{2}}$



$\int_{t-2}^1 (1)(-t+\tau+2)\,d\tau + \int_1^2 (2)(-t+\tau+2)\,d\tau$

$-t\tau + \frac{1}{2}\tau^2 + 2\tau \Big|_{t-2}^1 = -t + \underbrace{\frac{1}{2} + 2}_{5/2} + \underbrace{t(t-2)}_{t^2-2t}$

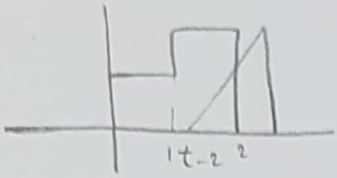
$-\frac{1}{2}\underbrace{(t-2)^2}_{t^2+4-4t} - 2(t-2)$

$-\frac{1}{2}t^2 - 2 + 2t$

$= \frac{1}{2}t^2 - 3t + \frac{9}{2}$

$-2t\tau + \tau^2 + 4\tau \Big|_1^2 = -4t + \cancel{4} + 8 + 2t - 1 - \cancel{4} = \boxed{-2t+7}$

$\Rightarrow \boxed{= \frac{1}{2}t^2 - 5t + \frac{23}{2}} \quad \Rightarrow 0 < t-2 < 1 \Rightarrow \boxed{2<t<3}$



$$\Rightarrow \int_{t-2}^{2} (2)(-t+\tau+2)\,d\tau$$

$$= -2t\tau + \tau^2 + 4\tau \Big|_{t-2}^{2}$$

$$= -4t+4+8+\underbrace{2t(t-2)}_{2t^2-4t}-\underbrace{(t-2)^2}_{-t^2-4+4t}-\underbrace{4(t-2)}_{-4t+8}$$

$$= \boxed{t^2-8t+16}$$

$$1<t-2<2 \Rightarrow \boxed{3<t<4}$$

$$\begin{cases} 0 & t<0 \\ -\frac{t^2}{2}+2t & 0<t<1 \\ -t^2+5t-\frac{5}{2} & 1<t<2 \\ \frac{1}{2}t^2-5t+\frac{23}{2} & 2<t<3 \\ t^2-8t+16 & 3<t<4 \\ 0 & t>4 \end{cases}$$

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$$\frac{d^2y}{dt^2}+4\frac{dy}{dt}+3y = 2\underbrace{\frac{dw}{dt}+w}_{2\delta'+\delta} \qquad w=\delta(t)$$

$$s^2+4s+3=0$$

$$(s+1)(s+3)=0 \rightarrow s_1=-1,\ s_2=-3 \quad \Rightarrow \quad y(t)=(k_1e^{-t}+k_2e^{-3t})\times u(t)$$

$$\frac{dy}{dt} = (-k_1e^{-t}-3k_2e^{-3t})u(t) + \underbrace{(k_1e^{-t}+k_2e^{-3t})}_{k_1+k_2}\delta(t) \quad \to t=0$$

$$\frac{d^2y}{dt^2} = (k_1e^{-t}+9k_2e^{-3t})u(t) + \underbrace{(-k_1e^{-t}-3k_2e^{-3t})}_{-k_1-3k_2}\delta(t) + (k_1+k_2)\delta'(t) \quad \to t=0$$

$$+(-4k_1e^{-t}-12k_2e^{-3t})u(t)+(4k_1+4k_2)\delta(t)+(3k_1e^{-t}+3k_2e^{-3t})u(t)$$

$$\begin{cases} k_1+k_2=2 \\ -k_1-3k_2+4k_1+4k_2=1 \end{cases} \Rightarrow \begin{cases} k_1+k_2=2 \\ 3k_1+k_2=1 \end{cases}$$

$$-2k_1=1 \Rightarrow \boxed{k_1=-\frac{1}{2}} \qquad k_2=2+\frac{1}{2}=\boxed{\frac{5}{2}}$$

$$\Rightarrow h(t)=\left(-\frac{1}{2}e^{-t}+\frac{5}{2}e^{-3t}\right)u(t)$$

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$$\frac{d^2y}{dt^2} + 2\frac{dy}{dt} + 2y = \frac{dw}{dt} + 2w$$

$\delta'(t) + 2\delta(t)$

$s^2 + 2s + 2 = 0 \Rightarrow s_{1,2} = -1 \pm j$ $\quad y(t) = e^{-t}(k_1 \cos t + k_2 \sin t)u(t)$

$\Delta = 4 - 4(1)(2) = -4$

$\hookrightarrow \frac{-2 \pm 2j}{2}$

$$\frac{dy}{dt} = -e^{-t}(k_1 \cos t + k_2 \sin t)u(t) + e^{-t}(-k_1 \sin t + k_2 \cos t)u(t)$$

$$+ \underbrace{e^{-t}}_{1}\underbrace{(k_1 \cos t + k_2 \sin t)}_{k_2}\delta(t) \quad \hookrightarrow t=0$$

$$\frac{d^2y}{dt^2} = e^{-t}(k_1 \cos t + k_2 \sin t)u(t) - e^{-t}(-k_1 \sin t + k_2 \cos t)u(t)$$

$$-e^{-t}\underbrace{(k_1 \cos t + k_2 \sin t)}_{-k_1}\delta(t) + e^{-t}\underbrace{(-k_1 \sin t + k_2 \cos t)}_{k_2}\delta(t)$$

$$-e^{-t}(-k_1 \sin t + k_2 \cos t)u(t) + e^{-t}(-k_1 \cos t - k_2 \sin t)u(t)$$

$$+k_2\delta'(t)$$

$$-2e^{-t}(k_1 \cos t + k_2 \sin t)u(t) + 2e^{-t}(-k_1 \sin t + k_2 \cos t)u(t) + 2k_2\delta(t)$$

$$+2e^{-t}(k_1 \cos t + k_2 \sin t)u(t) = \delta'(t) + 2\delta(t)$$

$k_2 = 1$

$-k_1 + k_2 + 2k_2 = 2 \Rightarrow 3k_2 - k_1 = 2 \Rightarrow \boxed{k_1 = 1}$

$h(t) = e^{-t}(\cos t + \sin t)u(t)$

$x(t) = (\cos t - \sin t)\,u(t) \rightarrow y = (e^{-t} - e^{-2t})\,u(t)$

$\hookrightarrow y' = (-e^{-t} + 2e^{-2t})\,u(t) + \underbrace{(e^{-t} - e^{-2t})}_{0}\,\delta(t)$

$x'(t) = (-\sin t - \cos t)\,u(t) + \underbrace{(\cos t - \sin t)}_{1}\,\delta(t)$

$y'' = (e^{-t} - 4e^{-2t})\,u(t) + \underbrace{(-e^{-t} + 2e^{-2t})}_{1}\,\delta(t)$

$x''(t) = \underbrace{(-\cos t + \sin t)\,u(t)}_{-x(t)} + \underbrace{(-\sin t - \cos t)}_{-1}\,\delta(t) + \delta'(t)$

$\delta'(t) - \delta(t) = x''(t) + x(t)$

$\Rightarrow y''(t) + y(t) = h'(t) - h(t) \Rightarrow \dfrac{dh}{dt} - h = (2e^{-t} - 5e^{-2t})\,u(t) + \delta(t)$

$\lambda - 1 = 0 \Rightarrow \lambda = +1 \Rightarrow y_g = ke^{t}$

$y_p = k_1 e^{-t} + k_2 e^{-2t}$

$\Rightarrow -k_1 e^{-t} - 2k_2 e^{-2t} - k_1 e^{-t} - k_2 e^{-2t} = 2e^{-t} - 5e^{-2t}$

$-2k_1 = 2 \Rightarrow \boxed{k_1 = -1}$

$-3k_2 = -5 \Rightarrow \boxed{k_2 = \frac{5}{3}}$

$y = y_g + y_p = (-e^{-t} + \frac{5}{3}e^{-2t} + ke^{t})\,u(t)$

$\Rightarrow (e^{-t} - \frac{10}{3}e^{-2t} + \cancel{ke^{t}})\,u(t) + \underbrace{(-e^{-t} + \frac{5}{3}e^{-2t} + ke^{t})}_{-1 + \frac{5}{3} + k}\,\delta(t)$

$+ (+e^{-t} - \frac{5}{3}e^{-2t} - \cancel{ke^{t}})\,u(t) = (2e^{-t} - \cancel{5e^{-2t}})\,u(t) + \delta(t)$

$k + \frac{2}{3} = 1 \Rightarrow \boxed{k = \frac{1}{3}}$

$y = (-e^{-t} + \frac{5}{3}e^{-2t} + \frac{1}{3}e^{t})\,u(t) = h(t)$

$s(t) = \int h(t)\,dt = e^{-t} - \frac{5}{6}e^{-2t} + \frac{1}{3}e^{t} + C$

$s(0) = 0 \Rightarrow \underbrace{1 - \frac{5}{6} + \frac{1}{3}}_{-3/6 = -\frac{1}{2}} + C = 0 \Rightarrow -\frac{1}{2}$

$\hookrightarrow s(t) = (e^{-t} - \frac{5}{6}e^{-2t} + \frac{1}{3}e^{t} - \frac{1}{2})\,u(t)$