EE3015
Monday ~~[illegible]~~ May 4th.
Review.

Convolution - integral

$x(t) \rightarrow \boxed{h(t)} \rightarrow y(t)$

$$y(t) = x(t) * h(t) = \int_{-\infty}^{\infty} x(\tau)h(t-\tau)d\tau = \int_{-\infty}^{\infty} h(\tau).x(t-\tau)d\tau$$

Q1: obtain $y(t)$ when $x(t)$: given ; $h(t)$: given
by (a). Convolution operation.
(b) Frequency domain operation.

Q2: obtain Fundamental period / Fundamental frequency of number of Discrete / Cont Signals

Q3: impulse response. & step response of a system
Cont / Discrete

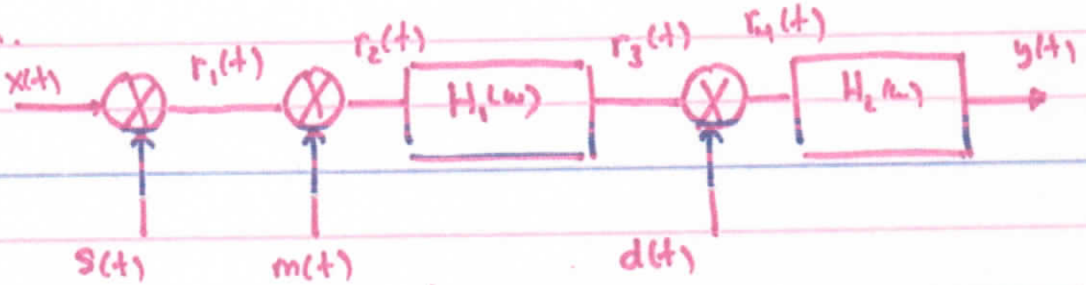
$x(n) \rightarrow \boxed{h(n)} \rightarrow y(n)$
$x(t) \rightarrow \boxed{h(t)} \rightarrow y(t)$

impulse response $y(t)$ when $x(t) = \delta(t)$ $x(n) = \delta(n)$
step response $y(t)$ " $x(t) = u(t)$ $x(n) = u(n)$

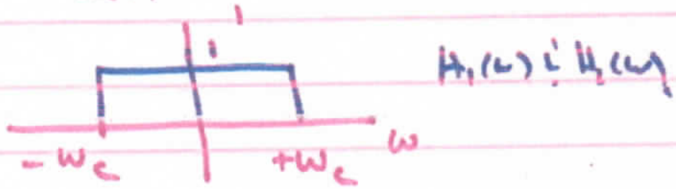
	periodic	nonperiodic
Q4: chapter 3, 4, 5	FS	FT
	DTFS	DTFT

Q5: Magnitude & phase.
Given profile of frequency response of a Transfer function (filter)
obtain output.

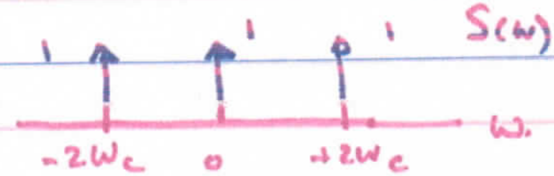
problem.



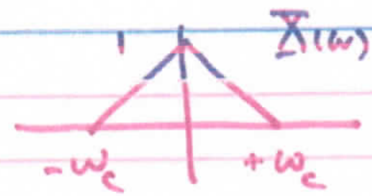
Both $H_1(\omega)$ & $H_2(\omega)$ have



S(t) has frequency profile ⇒



x(t) has frequency profile



Question:? For which of The following choices for m(t) and d(t) y(t) is non Zero.

(a) $m(t) = 1$ $d(t) = 1$ *

(b) $m(t) = \cos(W_c t)$ $d(t) = \cos(W_c t)$ *

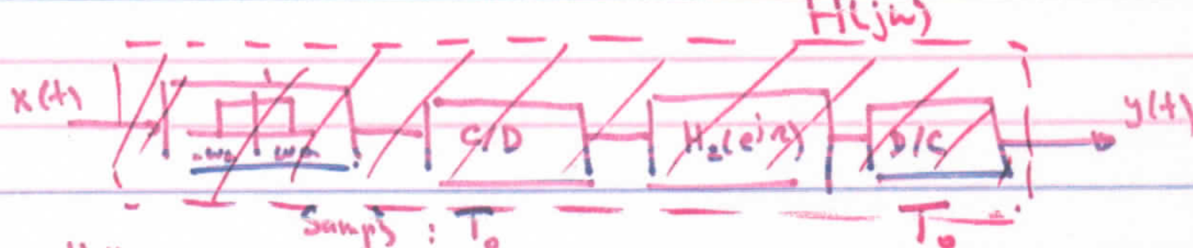
(c) $\sin(W_c t) = m(t)$ $d(t) = \sin(W_c t)$

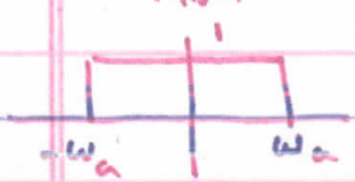
(d) $m(t) = \cos(2W_c t)$ $d(t) = \cos(2W_c t)$

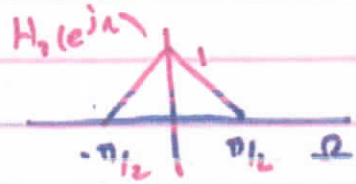
(e) $m(t) = \cos(2W_c t)$ $d(t) = \cos(W_c t)$

Wed Dec 12Th
EE 345

problem: Given This Filtering operation.

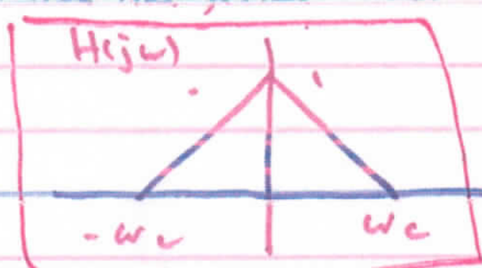






input signal x(t) has Fourier representation as

Q: Find in terms of w_c The value of The sampling period T_o and corresponding w_a such That The Total continuous time filter has.

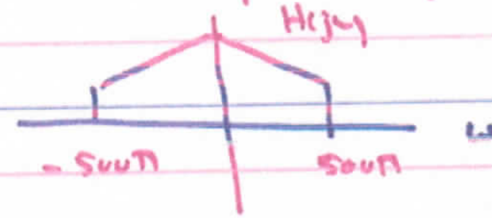


$$\boxed{T_o = \frac{\pi/2}{w_c}} \; ?$$

$$\frac{2\pi}{T_o} = \frac{2\pi}{(\pi/2)/w_c} = 4w_c$$

$$\boxed{w_a = 2w_c} \; ?$$

problem. Consider The frequency response $H(j\omega)$



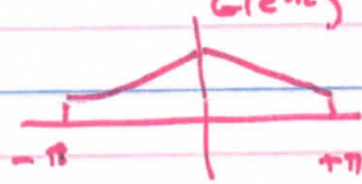
we want to implement This continuous filter using Discrete-time-processing

(a) what is The maximum value of sampling period T required $T = ?$

(b) what is The required $H(e^{j\Omega})$

(c) sketch The Total system

$$T_{max} = \frac{\pi}{500\pi} = 2 \text{ msec.} \qquad \Omega = \pi$$



Laplace - Transform.

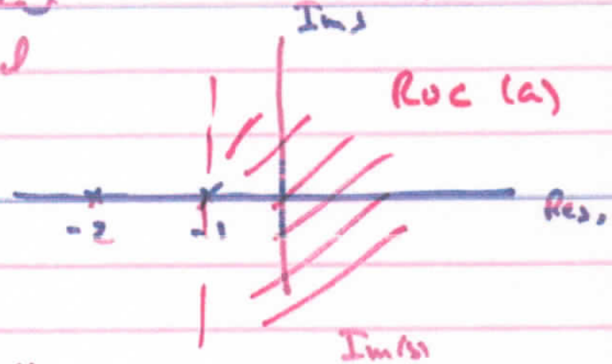
problem. Determine The following $\mathcal{L}$

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

(a) $x(t)$ if it is right handed toward positive $t > 0$

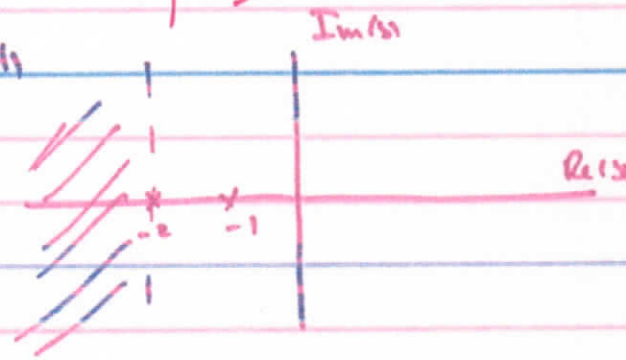
(b) $x(t)$ is left handed $t < 0$

(c) $x(t)$ is two sided



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

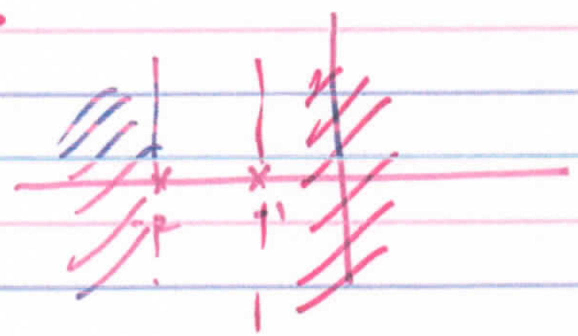
(a) $x(t) = e^{-t}u(t) - e^{-2t}u(t)$



(b)

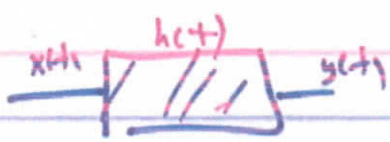
$$x(t) = -e^{-t}u(-t) + e^{-2t}u(-t)$$

(c)



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

problem: Given a LTI Causal System



where $\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = x(t) + 2\frac{dx(t)}{dt}$

(a) Determine the system transfer function $H_c(s)$ and obtain $h_c(t)$

Assume all initial cond. are at zero.

(b). Determine the system $H_d(z)$ of a discrete-Time LTI Causal system obtained from $H_c(s)$ via impulse invariant method

$$\Omega = \omega \cdot T$$

$$H_c(s) \qquad s = j\omega \longleftrightarrow z = e^{j\Omega}$$

$$z = e^{sT}$$

$$H_c(s) = \frac{2s+1}{s^2+5s+6} \quad ? \quad H_d(z)$$

$$s = \frac{1}{T}\ln(z)$$

$$H_d(z) = \frac{2\left(\frac{1}{T}\ln(z)\right)+1}{\left(\frac{1}{T}\ln(z)\right)^2 + 5\left(\frac{1}{T}\ln(z)\right)+6}$$

in Discrete LTI Causal system

problem Given The difference eq.

$X(z) \quad H(z) \quad Y(z)$

$x(n) \rightarrow \boxed{h(n)} \rightarrow y(n)$

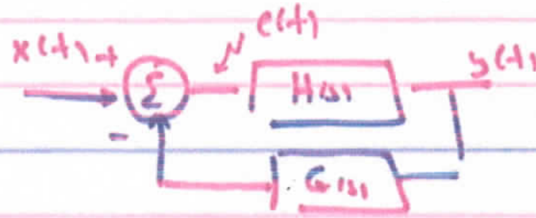
$$y(n) - 3y(n-1) + 2y(n-2) = x(n)$$

(a) Find $H(z) = \dfrac{1}{(1-2z^{-1})(1-z^{-1})} = \dfrac{2}{1-2z^{-1}} + \dfrac{-1}{1-z^{-1}}$

(b) Find impulse response $h(n) = ? = 2(2^n)u(n) + (-1)(1^n)u(n)$

(c) is This stable (unstable) $z_1 = 1$, $z_2 = 2$

problem - Consider two feed back system

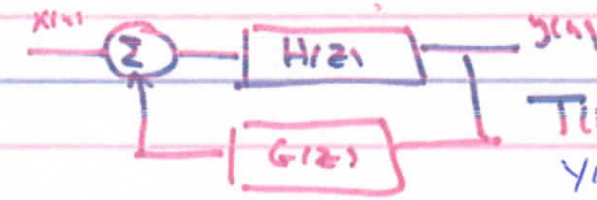


$$T(s) = \frac{H(s)}{1 + G(s)H(s)}$$

$$\frac{Y(s)}{X(s)} = \frac{H(s)}{1+G(s)H(s)}$$

$x(t) = \delta(t)$ $X(s) = 1$

$y(t)$:



$x(n) = \delta(n)$

$X(z) = 1$

$$T(z) = \frac{H(z)}{1 + G(z)H(z)}$$

$$\frac{Y(z)}{X(z)}$$

if $H(s) = \frac{1}{s+3}$, $G(s) = s+1$

& $H(z) = \frac{2}{3} - \frac{1}{6} z^{-1}$ $G(z) = \frac{z^{-1}}{1 - \frac{1}{2} z^{-1}}$

Find the impulse responses of each closed loop system