Matthew Malone Exam 1 A57487585

1A.

	Linear	Time Invariant	Static	Causal	Stable
$y[n] = x[-n]$	Yes	No	NO	NO	yes
$y[n] = 2n^2 x[n] + \cos(x[n])$	Yes	NO	No	NO	NO
$y[n] = \cos(2\pi x[n])$	NO	Yes	Yes	Yes	Yes

B $\omega = \Omega T$

$F_s = 100\ Hz = \frac{1}{T} \Rightarrow T = 0.01$

$\omega = 2\pi \Rightarrow \frac{2\pi}{0.01} = \Omega = 200\pi$

$\Omega = \frac{1}{400}, \frac{2}{800}$

C ideal sampling Frequency is

$0 < n < \infty$ for $x(t) = v(t)$

D. $x[n] = 3\delta[n] + \delta[n-1]$

$y[n] = h[n] * x[n] = 3h[n] + h[n-1]$

$y[n] = \{6, -1, 2, 1\}$

$6 = 3h(0) \quad h(0) = 2$

$-1 = 3h[1] + 2 \quad h[1] = -1$

$2 = 3h[2] + (-1) \quad h(2) = 1$

$1 = 3h[3] + 1 \quad h(3) = 0$

$h[n] = 2 - 1 + 1 = 2$

E. iii

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2 $y[n] = \frac{2}{15}y[n-1] - \frac{1}{15}y[n-2] - x[n]$; $y[-1] = 1$, $y[-2] = -1$

A Find $H[n]$

$$\lambda^n - \frac{2}{15}\lambda^{n-1} - \frac{1}{15}\lambda^{n-2} = 0$$

$$(\lambda - 2.4)(\lambda + 0.4)$$

$$h[n] = [C_1(2.4)^n + C_2(-0.4)^n]u[n]$$

$y[0] = 1$

$y[1] = \frac{2}{15}y[0] = \frac{2}{15}$

$C_1 = 1 - C_2$

$h[0] = C_1 + C_2 = 1$

$h[1] = 2.4C_1 - 0.4C_2 = .13$

$2.4 - C_2 2.4$

$C_1 = -0.23$

$C_2 = 1.23$

$$h[n] = -0.23(2.4)^n + 1.23(-0.4)^n]u[n]$$

B. Stable roots > 1, FIR

C. ZSR $x[n] = u[n]$

$y_p[n] = Ku[n]$

$K u[n] - K\frac{2}{15}^{n-1} - K\frac{1}{15}^{n-2} u[n] - K u[n]$

$n \geq 1$

$K =$

D ZIR

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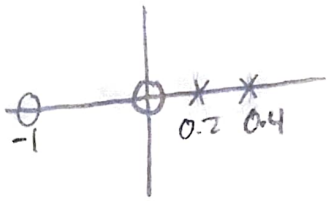
3. $H(z) = \frac{1+z^{-1}}{1-\frac{3}{5}z^{-1}+\frac{2}{25}z^{-2}}$

A. $Y(z) - \frac{3}{5}z^{-1}Y(z) - \frac{2}{25}Y(z)z^{-2} = X(z) + z^{-1}X(z)$

$y[n] - \frac{3}{5}y[n-1] - \frac{2}{25}y[n-2] = x[n] + x[n-1]$

B. Gain is positive

C. $H(z) = \frac{z^2+z}{z^2-\frac{3}{5}z+\frac{2}{25}} = \frac{z(z+1)}{(z-0.2)(z-0.4)}$



D ROC $|z| \neq 0.2$ $|z| \neq 0.4$

E. Yes system is stable from all poles inside of Unit circle

F. $x[n] = \frac{2}{5}u[n] + \frac{1}{5}u[n]$

IDK