+002 Control Engineering Summer '08

-) $g_0 = 0$ $g_6 = 0.1$

$g_1 = 1.1$ $g_7 = -0.15$

$g_2 = 0.8$ $g_8 = 0.02$

$g_3 = -0.1$ $g_9 = 0.01$

$g_4 = -0.4$ $g_{10} = 0$

$g_5 = 0.15$ $g_{11} = 0$

$$G(z) = \sum_{k=0}^{\infty} g(k) z^{-k} = g_0 + g_1 z^{-1} + \dots$$

$$H(z) = G(z)U(z) = G(z)\frac{1}{1-z^{-1}} = h_0 + h_1 z^{-1} + h_2 z^{-2} + \dots$$

$$(1-z^{-1})(h_0 + h_1 z^{-1} + h_2 z^{-2} + \dots + h_{n-1} z^{-(n-1)} + h_n z^{-n} + h_{n+1} z^{-(n+1)}) = g_0 + g_1 z^{-1} + \dots$$

$h_0 = g_0$

$h_i = g_i + h_{i-1}$

$h_0 = 0$ $h_6 = 1.65$

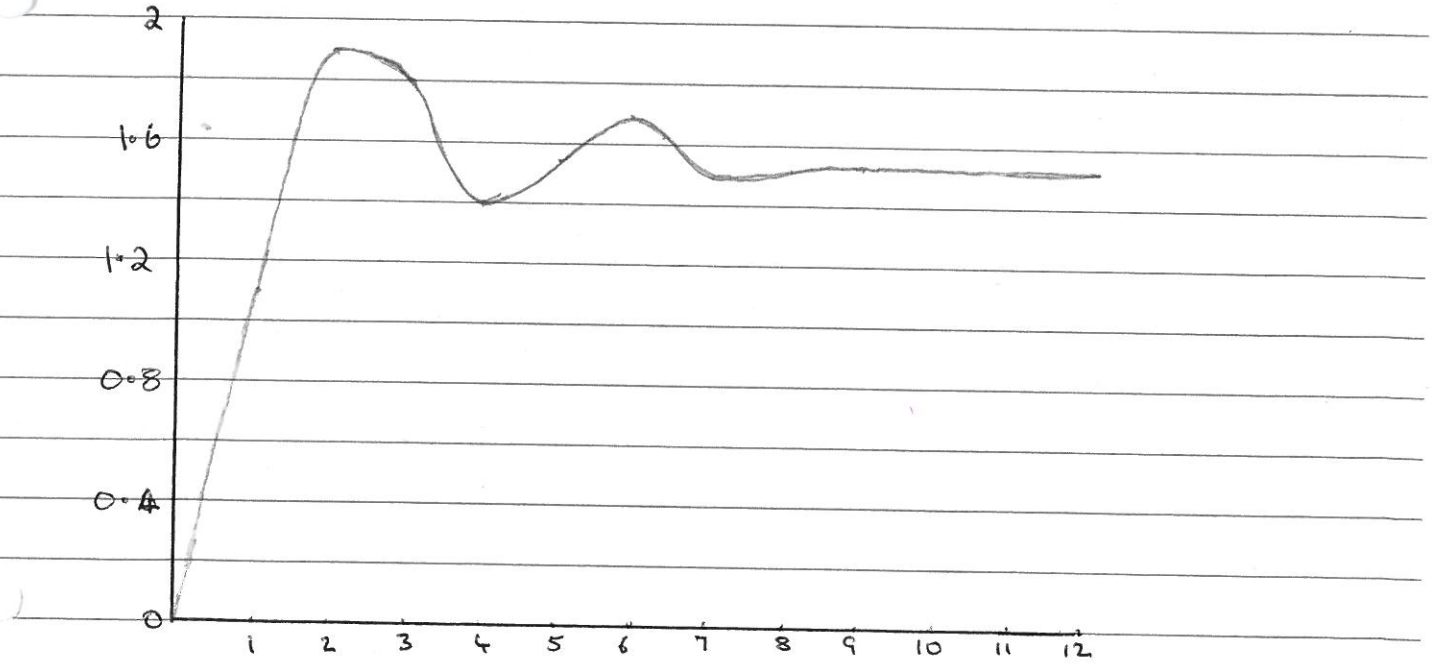
$h_1 = 1.1$ $h_7 = 1.5$

$h_2 = 1.9$ $h_8 = 1.52$

$h_3 = 1.8$ $h_9 = 1.53$

$h_4 = 1.4$ $h_{10} = 1.53$

$h_5 = 1.55$ $h_{11} = 1.53$



1a) Stability:

$$G(z) = 1 \cdot 1z^{-1} + 0 \cdot 8z^{-2} - 0 \cdot 1z^{-3} \ldots$$

$$1 \cdot 1z^{-1} + 0 \cdot 8z^{-2} - 0 \cdot 1z^{-3} \;\overline{)}\; 1$$

$$0 \cdot 91z - 0 \cdot 662 + 0 \cdot 5642z^{-1}$$

$$1 + 0 \cdot 728z^{-1} - 0 \cdot 091z^{-2}$$

$$-0 \cdot 728z^{-1} + 0 \cdot 091z^{-2}$$

$$+0 \cdot 728z^{-1} + 0 \cdot 596z^{-2}$$

$$0 \cdot 6206z^{-2}$$

$$0 \cdot 6206z^{-2} + \ldots$$

~~Poles~~ $z = 0 \cdot 364 \pm j0 \cdot 7$

$|z| = 0 \cdot 789$

$\therefore$ Lies within unit circle

$\Rightarrow$ System is stable