EGRG 420 H.W. #8 (Sol.)

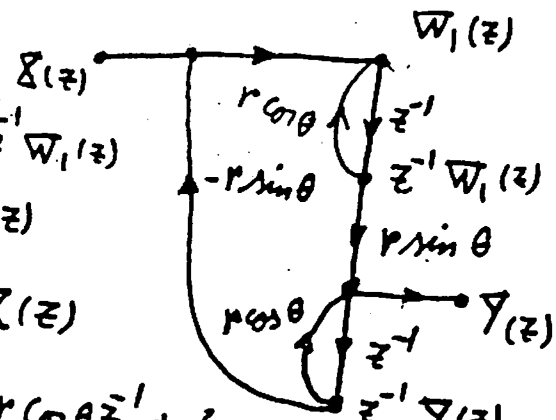
4.11 obtain the transfer fnc?s

Network 1: $Y(z) = 2r\cos\theta\, z^{-1} Y(z) - r^2 z^{-2} Y(z) + X(z)$

$\Rightarrow \quad H_1(z) = 1 / [1 - 2r\cos\theta\, z^{-1} + r^2 z^{-2}]$

Network 2: Define $W_1(z)$ as shown below

Then



$W_1(z) = X(z) - r\sin\theta\, z^{-1} Y(z) + r\cos\theta\, z^{-1} W_1(z)$

$Y(z) = r\sin\theta\, z^{-1} W_1(z) + r\cos\theta\, z^{-1} Y(z)$

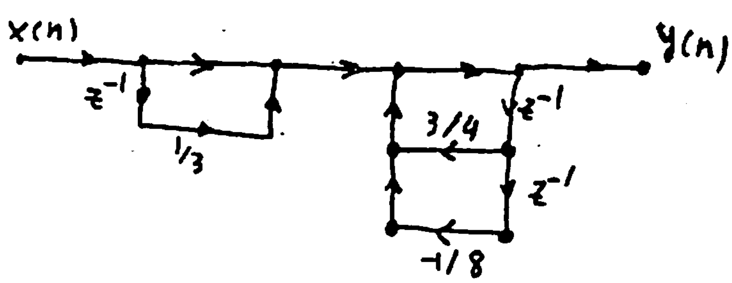
solving for $Y(z)$ in terms of $X(z)$

$\Rightarrow Y(z) = X(z)\; r\sin\theta\, z^{-1} / [1 - 2r\cos\theta\, z^{-1} + r^2 z^{-2}]$

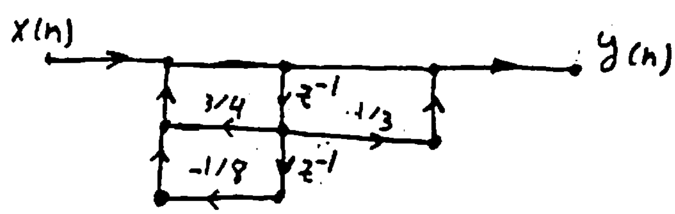
or $H_2(z) = r(\sin\theta)\, z^{-1} / [1 - 2r\cos\theta\, z^{-1} + r^2 z^{-2}]$

Thus both networks have the same poles

4.7 (a)



(b)

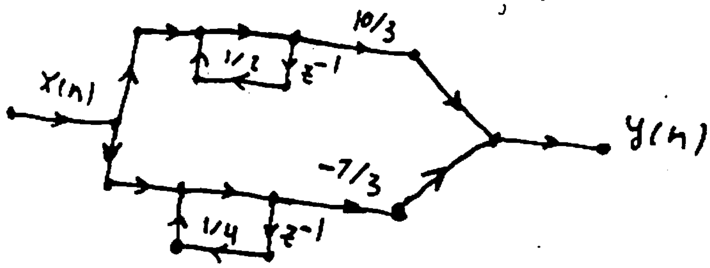


(c) $H(z) = \dfrac{1 + \frac{1}{3} z^{-1}}{(1 - \frac{1}{2} z^{-1})(1 - \frac{1}{4} z^{-1})}$

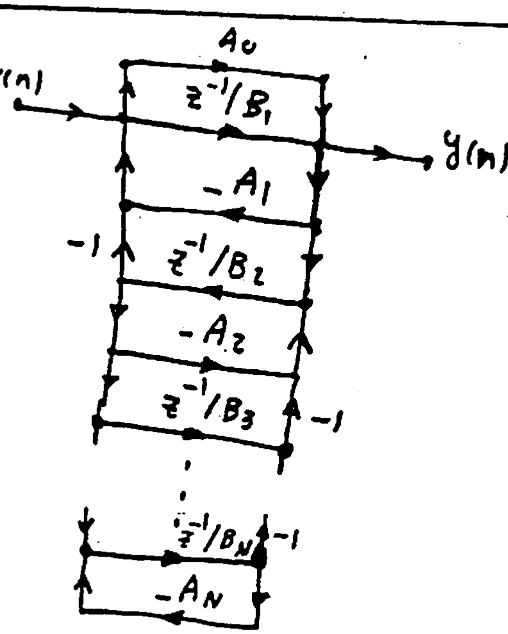
may be combined

4.7 cont.'d

(d) $H(z) = \dfrac{10/3}{1-\frac{1}{2}z^{-1}} + \dfrac{-7/3}{1-\frac{1}{4}z^{-1}}$



4.10 (a)



b) $H(z) = \dfrac{1}{1-2r\cos\theta z^{-1}+r^2z^{-2}} = \dfrac{z^2}{z^2-2r\cos\theta z+r^2} = \underset{A_0}{1} + \underbrace{\dfrac{2r\cos\theta z-r^2}{z^2-2r\cos\theta z+r^2}}_{G_0(z)}$

$G_0(z) = \dfrac{1}{\underbrace{\dfrac{1-4\cos^2\theta}{4\cos^2\theta}}_{A_1} + \underbrace{\dfrac{1}{2r\cos\theta}}_{B_1} + \underbrace{\dfrac{r^2/4\cos^2\theta}{2r\cos\theta z-r^2}}_{G_1(z)}}$

$G_1(z) = \dfrac{1}{\underbrace{-4\cos^2\theta}_{A_2} + \underbrace{\dfrac{8\cos^3\theta}{r}}_{B_2}}$

c) $\longrightarrow$