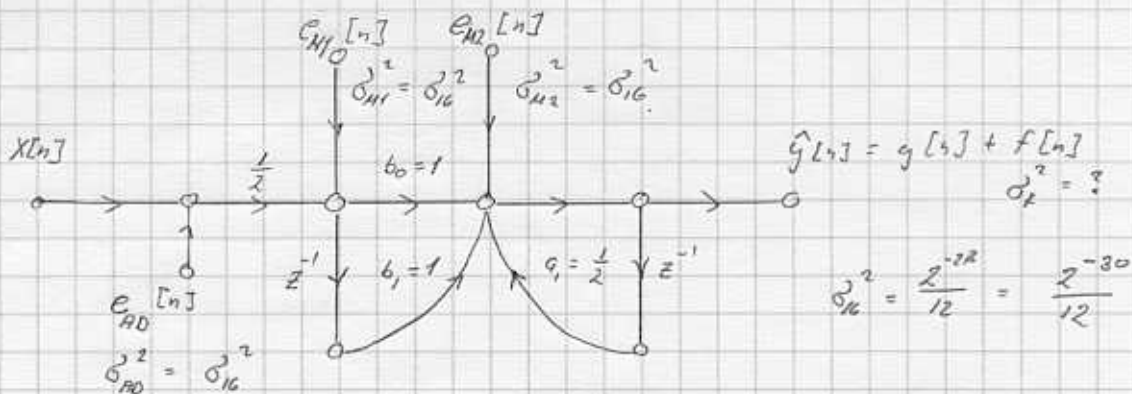


a)



c)

$$H_{AD-F}(z) = \frac{1}{2} \frac{b_0 + b_1 z^{-1}}{1 - a_1 z^{-1}} = \frac{1}{2} \frac{1 + z^{-1}}{1 - \frac{1}{2} z^{-1}} = \frac{1}{2} \frac{z+1}{z-\frac{1}{2}}$$

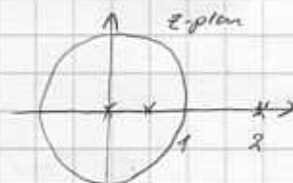
$$H_{MI-F}(z) = \frac{b_0 + b_1 z^{-1}}{1 - a_1 z^{-1}} = \frac{1 + z^{-1}}{1 - \frac{1}{2} z^{-1}} = \frac{z+1}{z-\frac{1}{2}}$$

$$H_{MR-F}(z) = \frac{1}{1 - a_1 z^{-1}} = \frac{1}{1 - \frac{1}{2} z^{-1}} = \frac{z}{z-\frac{1}{2}}$$

$$H_{AD-F}(z^{-1}) = \frac{1}{2} \frac{1+z}{1-\frac{1}{2}z} ; H_{MI-F}(z^{-1}) = \frac{1+z}{1-\frac{1}{2}z} ; H_{MR-F}(z^{-1}) = \frac{1}{1-\frac{1}{2}z} ;$$

$$\frac{1}{2\pi} \int_{-\pi}^{\pi} |H_{AD-F}(e^{j\omega})|^2 d\omega = \frac{1}{2\pi} \int_{-\pi}^{\pi} \left| \frac{1}{2} \frac{1+e^{j\omega}}{1-\frac{1}{2}e^{j\omega}} \right|^2 d\omega = 1$$

$$= \frac{1}{j2\pi} \oint_{C:|z|=1} H_{AD-F}(z) H_{AD-F}(z^{-1}) z^{-1} dz = \frac{1}{j2\pi} \oint_{C:|z|=1} \frac{(z+1)^2}{4(z-\frac{1}{2})(1-\frac{1}{2}z)z} dz$$



$$= \frac{(z+1)^2 (z-\frac{1}{2})}{4(z-\frac{1}{2})(1-\frac{1}{2}z)z} \Big|_{z=\frac{1}{2}} + \frac{(z+1)^2 z}{4(z-\frac{1}{2})(1-\frac{1}{2}z)z} \Big|_{z=0} = 1$$

$$\frac{1}{2\pi} \int_{-\pi}^{\pi} |H_{MI-F}(e^{j\omega})|^2 d\omega = 4 \text{ ses. ol del forsgöende}$$

$$\frac{1}{2\pi} \int_{-\pi}^{\pi} |H_{MR-F}(e^{j\omega})|^2 d\omega = \frac{1}{2\pi} \int_{-\pi}^{\pi} \left| \frac{1}{1-a_1 e^{j\omega}} \right|^2 d\omega = \frac{4}{3}$$

$$= \frac{1}{j2\pi} \oint_{C:|z|=1} H_{MR-F}(z) H_{MR-F}(z^{-1}) z^{-1} dz = \frac{1}{j2\pi} \oint_{C:|z|=1} \frac{1}{(z-\frac{1}{2})(1-\frac{1}{2}z)} dz$$

