

Day... Month... Year...

HWA

Subject...

9124401

$$x[n] = (a^n u[n] \cos(\omega_0 n))$$

$$X(z) = \sum_{n=0}^{+\infty} a^n \left( \frac{1}{r} e^{j\omega_0 n} + \frac{1}{r} e^{-j\omega_0 n} \right) z^{-n} =$$

$$\frac{1}{r} \sum_{n=0}^{+\infty} a e^{j\omega_0 n} z^{-n} + \frac{1}{r} \sum_{n=0}^{+\infty} a e^{-j\omega_0 n} z^{-n} =$$

$$\frac{1}{r} \sum_{n=0}^{+\infty} (a e^{j\omega_0} z^{-1})^n + \frac{1}{r} \sum_{n=0}^{+\infty} (a e^{-j\omega_0} z^{-1})^n =$$

$$\frac{1}{r} \left( \frac{1}{1 - a e^{j\omega_0} z^{-1}} \right) + \frac{1}{r} \left( \frac{1}{1 - a e^{-j\omega_0} z^{-1}} \right) =$$

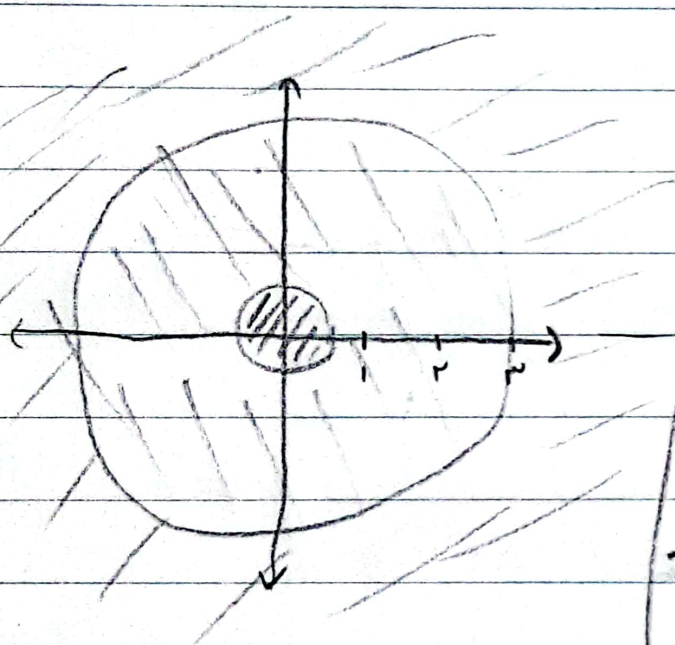
$$\frac{1}{r} \left( \frac{1}{1 - a e^{j\omega_0} z^{-1}} + \frac{1}{1 - a e^{-j\omega_0} z^{-1}} \right) =$$

$$|z^{-1} a e^{j\omega_0}| < 1 \Rightarrow |a e^{j\omega_0}| < |z| \quad ; \text{Roc}$$

$$|z^{-1} a e^{-j\omega_0}| < 1 \Rightarrow |a e^{-j\omega_0}| < |z|$$

$$X(z) = \frac{6 - 17z^{-1}}{17z^{-1} - 17z^{-1} + 17} = \frac{6}{z^{-1} - 1} = -17$$

$$\frac{-17}{\frac{1}{17}z^{-1} - 1} = \frac{1}{17z^{-1} - 1} = \frac{17}{1 - \frac{1}{17}z^{-1}}$$



$$|z| > 1, |z| < \frac{1}{17}$$

$$x(n) = 17\left(\frac{1}{17}\right)^n u[n] + 17^n u[n]$$

$$|z| < 1, |z| > \frac{1}{17}$$

$$x(n) = 17\left(\frac{1}{17}\right)^n u[n] - 17^n u[-n-1]$$

$$|z| < 1, |z| < \frac{1}{17}$$

$$x(n) = -17\left(\frac{1}{17}\right)^n u[n-1] - 17^n u[-n-1]$$



مسئله الف)

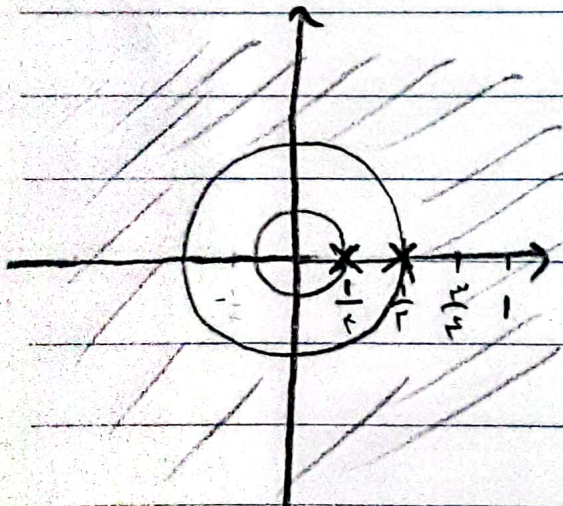
$$Y(z) - \frac{r}{R} z^{-1} Y(z) + \frac{1}{R} z^{-2} Y(z) = X(z)$$

$$Y(z) \left( 1 - \frac{r}{R} z^{-1} + \frac{1}{R} z^{-2} \right) = X(z)$$

$$H(z) = \frac{Y(z)}{X(z)} = \frac{1}{1 - \frac{r}{R} z^{-1} + \frac{1}{R} z^{-2}} = \frac{1}{z^2 - \frac{r}{R} z + 1}$$

$$\frac{1}{(z^{-1} - r)(z^{-1} - R)} = \frac{-r}{(z^{-1} - r)} + \frac{R}{(z^{-1} - R)} \Rightarrow$$

$$H(z) = \frac{r}{1 - \frac{1}{R} z^{-1}} - \frac{1}{1 - \frac{1}{r} z^{-1}}$$



مسئله ب) معفر ندارد

سیستم علی  $\Leftarrow$  ROC بیرونی ترین

$$Y(z) = H(z) \cdot X(z)$$

2-3

$$X(z) = \frac{1}{1 - \frac{1}{r} z^{-1}}$$

$$\text{ROC: } |z| > \frac{1}{r}$$

$$Y(z) = \left( \frac{1}{1 - \frac{1}{r} z^{-1}} \right) \left( \frac{r}{1 - \frac{1}{r} z^{-1}} - \frac{1}{1 - \frac{1}{r} z^{-1}} \right) =$$

$$\frac{r}{(1 - \frac{1}{r} z^{-1})(1 - \frac{1}{r} z^{-1})} - \frac{1}{(1 - \frac{1}{r} z^{-1})(1 - \frac{1}{r} z^{-1})} = \frac{1}{1 - \frac{1}{r} z^{-1}}$$

$$\Rightarrow y[n] = \frac{1}{r} u[n] \quad |z| > \frac{1}{r}$$



$$x(t) = t^r u(t+1)$$

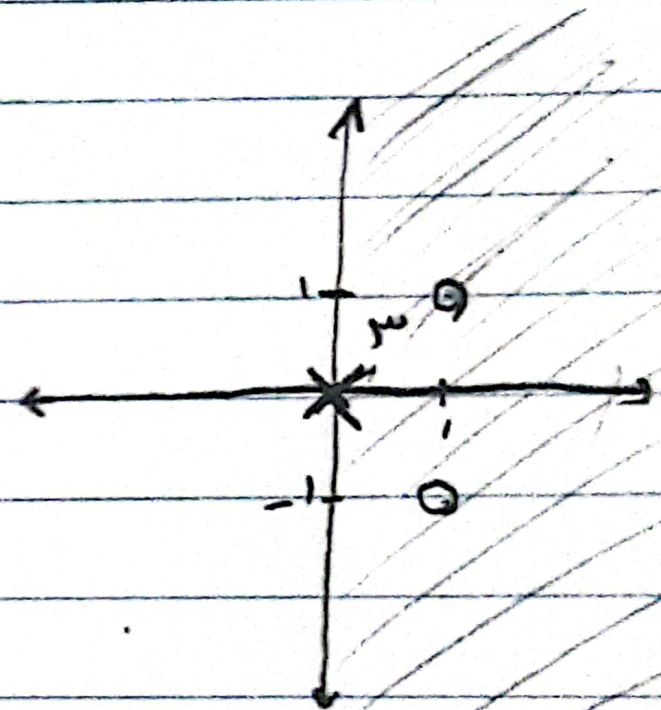
(a-r)

$$X(s) = \frac{d^r}{ds^r} \mathcal{L}\{u(t+1)\}$$

$$X(s) = \frac{d^r}{ds^r} \left( \frac{e^s}{s} \right) =$$

$$\frac{d}{ds} \left( \frac{e^s s - e^s}{s^r} \right) = \frac{e^s (s^r - r s - 1)}{s^{r+1}}$$

$$R_0 < \operatorname{Re}\{s\} > 0$$



$$x(t) = t e^{-r|t|} = -t e^{rt} u(-t) + t e^{-rt} u(t) =$$

$$-t f(t) + t f(t)$$

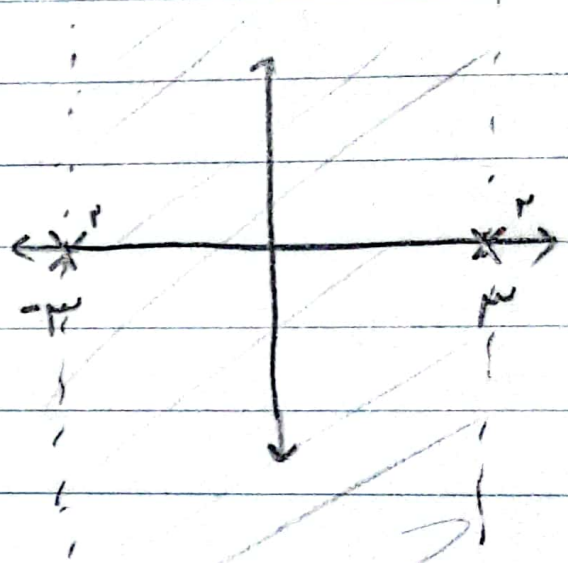
$$G(s) = -\frac{1}{s-r}$$

$$F(s) = \frac{1}{s+r}$$

$$\text{Re}\{s\} < r$$

$$\text{Re}\{s\} > -r$$

$$\Delta(s) = \frac{1}{(s-r)^r} + \frac{1}{(s+r)^r}$$



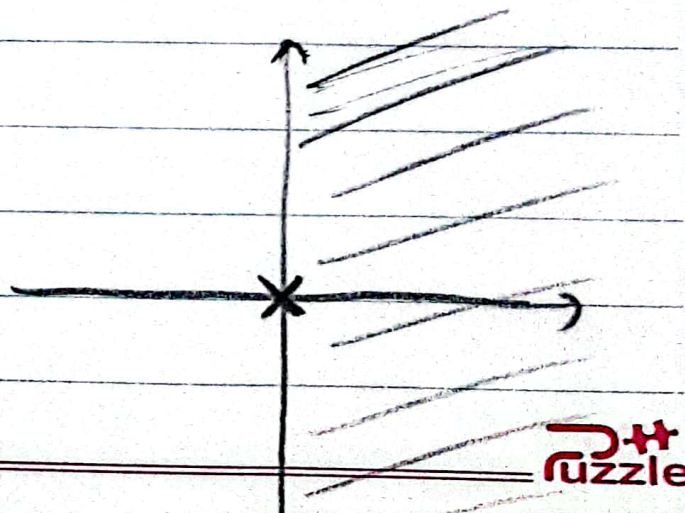
$$\text{Roc: } -r < \text{Re}\{s\} < r$$

$$\mathcal{L}\{u(t)\} = \frac{1}{s}, \quad \mathcal{L}\{u(t-a)\} = \frac{e^{-sa}}{s} \quad (a > 0)$$

$$x(t) = u(t+1) - u(t-1)$$

$$\Delta(s) = \frac{e^{-s}}{s} - \frac{e^{+s}}{s}$$

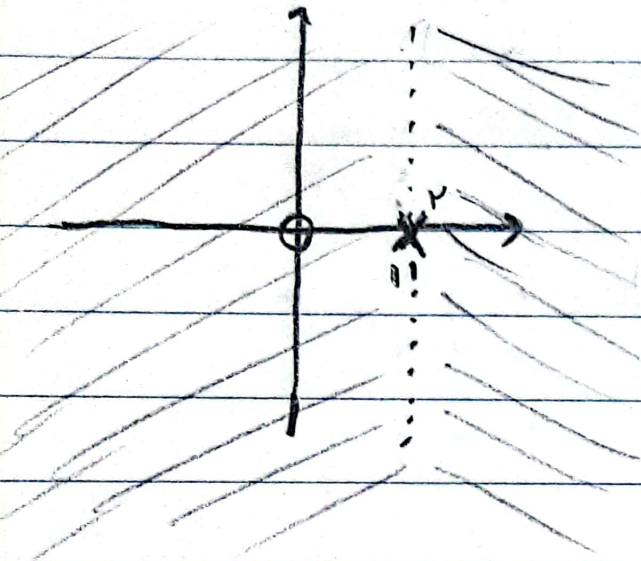
$$\text{Roc: } \text{Re}\{s\} > 0$$





$$M(s) = \frac{s^2}{(s-1)^2 (s^2 + 6 + 1)}$$

در حالت ROC دسے راسخ :



سیستم گویا علی

نہ بیرون ROC  $\Rightarrow$  ناپیدار

صفر بیرون ROC  $\Rightarrow$  وارون ناپذیر

در حالت ROC دسے چیں :

سیستم غیر علی

محور نہ داخل ROC  $\Rightarrow$  ناپیدار

صفر داخل ROC  $\Rightarrow$  وارون ناپذیر