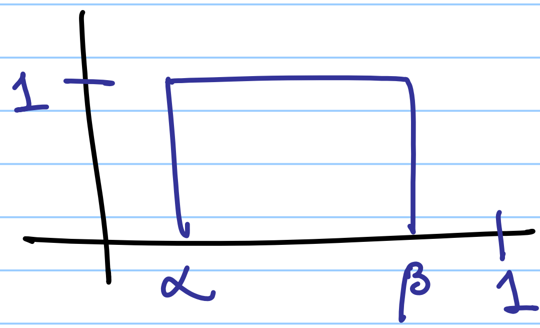
Note Title 4/12/2016

ECE 615 - Lecture 25

z-domain to s-domain IIT Tables



s-DOMAIN EQUIVALENCES FOR z-DOMAIN LOOP FILTER POLES

z-domain pole	s-domain equivalent	Limit for $z_k = 1$
$\frac{1}{z-z_k}$	$\frac{r_0}{s-s_k} \times \frac{1}{z_k^{1-\alpha}-z_k^{1-\beta}}$ $r_0 = s_k$	$\frac{r_0}{s-s_k}$ $r_0 = \frac{1}{\beta-\alpha}$
$\frac{1}{(z-z_k)^2}$	$\frac{r_1 s+r_0}{(s-s_k)^2} \times \frac{1}{z_k(z_k^{1-\alpha}-z_k^{1-\beta})^2}$ $r_1 = q_1 s_k + q_0$ $r_0 = q_1 s_k^2$ $q_1 = z_k^{1-\beta}(1-\beta) - z_k^{1-\alpha}(1-\alpha)$ $q_0 = z_k^{1-\alpha} - z_k^{1-\beta}$	$\frac{r_1 s+r_0}{(s-s_k)^2}$ $r_1 = \frac{1}{2}\frac{\alpha+\beta-2}{\beta-\alpha}$ $r_0 = \frac{1}{\beta-\alpha}$
$\frac{1}{(z-z_k)^3}$	$\frac{r_2 s^2+r_1 s+r_0}{(s-s_k)^3} \times \frac{1}{z_k^2(z_k^{1-\alpha}-z_k^{1-\beta})^3}$ $r_2 = \frac{1}{2}q_2 s_k - q_1$ $r_1 = -q_2 s_k^2 + q_1 s_k + q_0$ $r_0 = \frac{1}{2}q_2 s_k^3$ $q_2 = (1-\beta)(2-\beta)(z_k^{1-\beta})^2$ $+ (1-\alpha)(2-\alpha)(z_k^{1-\alpha})^2$ $+ [\beta(\beta+3)+\alpha(\alpha+3)$ $- 4(1+\alpha\beta)]z_k^{1-\alpha}z_k^{1-\beta}$ $q_1 = (\frac{3}{2}-\beta)(z_k^{1-\beta})^2 + (\frac{3}{2}-\alpha)(z_k^{1-\alpha})^2$ $+ (\alpha+\beta-3)z_k^{1-\alpha}z_k^{1-\beta}$ $q_0 = (z_k^{1-\alpha}-z_k^{1-\beta})^2$	$\frac{r_2 s^2+r_1 s+r_0}{(s-s_k)^3}$ $r_2 = \frac{1}{12}\frac{1}{\beta-\alpha}[\beta(\beta-9)$ $+ \alpha(\alpha-9)+4\alpha\beta+12]$ $r_1 = \frac{1}{2}\frac{\alpha+\beta-3}{\beta-\alpha}$ $r_0 = \frac{1}{\beta-\alpha}$

$\frac{1}{z-1}$ $\quad \frac{r_0}{s}$

$\frac{1}{(z-1)^2}$ $\quad \frac{r_0}{s} + \frac{r_1}{s^2}$

$S_k = \ln(z_k)$

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

$\rightarrow \frac{r_0}{s-s_k} = \frac{r_0}{s}$

z-domain $\xrightarrow{p(t)}$ s-domain

"IIT Table"