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**ECE 479/579 Digital Control Systems**

Homework Assignment #7

6.3 The following transfer function is a lead network designed to add about 60 phase lead at 



(a) For each of the following design method compute and plot in the z-plane the pole and zero locations and compute the amount of phase lead given by the equivalent network at  if  sec and the design is via

i. Forward rectangular rule

ii. Backward rectangular rule

iii. Bilinear rule

iv. Bilinear with prewarping (use as the warping frequency)

v. Zero-pole mapping

vi. Zero-order-hold equivalent

vii. Triangular-hold equivalent

(b) Plot over the frequency range the amplitude and phase Bode Plots for each of the above equivalents.

Answer:



For continuous system at 3 rad/sec, the phase angle is  .

After getting the H(z) function, use  to calculate phase.

i. Forward rule:





ii. Backward rule:





iii. Bilinear rule:





iv. Bilinear with prewarping (use as the warping frequency):





v. Zero-pole mapping:





vi. Zero-order-hold equivalent:





vii. Triangular-hold equivalent





b)



Zoomed in Bode Diagram when :

