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17/Eng04/04/

Electrical/Electronics Engineering

TAModilim

EEE 441

2)

$$\begin{array}{llll}
s^4 & a_4 & a_2 & a_0 \\
s^3 & a_3 & a_1 & 0 \\
s^2 & b_1 & b_2 & 0 \\
s^1 & c_1 & 0 & 0 \\
s^0 & d_1 & 0 & 0
\end{array}$$

$$b_1 = -\frac{\begin{vmatrix} a_4 & a_2 \\ a_3 & a_1 \end{vmatrix}}{a_3} \qquad b_2 = -\frac{\begin{vmatrix} a_4 & a_0 \\ a_3 & 0 \end{vmatrix}}{a_3}$$

$$b_3 = -\frac{\begin{vmatrix} a_4 & 0 \\ a_3 & 0 \end{vmatrix}}{a_3} = 0$$

for C

$$c_1 = -\frac{\begin{vmatrix} a_3 & a_1 \\ b_1 & b_2 \end{vmatrix}}{b_1} \qquad c_2 = -\frac{\begin{vmatrix} a_3 & 0 \\ b_1 & 0 \end{vmatrix}}{b_1} = 0$$

for d

$$d_1 = -\frac{\begin{vmatrix} b_1 & b_2 \\ c_1 & 0 \end{vmatrix}}{c_1}$$

∴ Standard eqn

$$b_{1k} = -\det\frac{\begin{vmatrix} a_n & a_{n-2k} \\ a_{n-1} & a_{n-1k-1} \end{vmatrix}}{a_{n-1}}$$

Where $d(s) = a_n s^n + a_{n-1}s^{n-1} + \dots a_1 s^1 + a_0$

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In a case where row is zero

$T(s) = 10$

$s^5 + 7s^4 + 6s^3 + 42s^2 + 8s + 56$

s^5	1	6	8
s^4	7	42	56
s^3	$\frac{-\begin{vmatrix}1 & 6\\7 & 42\end{vmatrix}}{7} = 0$	$\frac{-\begin{vmatrix}1 & 0\\7 & 56\end{vmatrix}}{7} = 0$	$\frac{-\begin{vmatrix}1 & 0\\7 & 0\end{vmatrix}}{7} = 0$

for $b_1 = \frac{(1\times42) - (6\times7)}{7} = \frac{42 - 42}{7} = \frac{0}{7} = 0$

$b_2 = \frac{(1\times56) - (7\times8)}{7} = \frac{56 - 56}{7} = \frac{0}{7} = 0$

$b_3 = \frac{(1\times0) - (7\times0)}{7} = \frac{0 - 0}{7} = 0$

row of zero appears

We develop a polynomial from row s^4

s^4 : 7 42 56

$f(s) = 7s^4 + 42s^2 + 56$ — i)

differentiation

$\frac{df(s)}{ds} = 28s^3 + 84s$ — ii)

then continue with auxillary equation @ 3rd row

s^5	1	6	8
s^4	7	42	56
s^3	28	84	0
s^2	21	56	0
s^1	28/3	0	0
s^0	56	0	0

$d_1 = \frac{(28\times42) - (84\times7)}{28} = 21$

$d_2 = \frac{(28\times56) - (7\times0)}{28} = 56$

$d_3 = \frac{(28\times0) - (7\times0)}{28} = 0$

$$e_1' = -1^{58} \frac{(21 \times 84) - (28 \times 56)}{21} =$$

$$e_2 = \frac{(21 \times 0) - (28 \times 0)}{21} = 0$$

$$f_1 = \frac{(28/3 \times 56) - (21 \times 0)}{28/3} \Rightarrow 58$$

Since there is no sign change the system is marginally stable

B) To determine poles on jw axis

Ans: when the entries from the row before the row of the zeros to the last row are looking at the even poly polynomials and there are no sign changes then all the poles belong to the jw axis

Question 7

In control theory and stability theory root locus analysis is a graphical method for examining how the roots of a system change with variation of a certain system parameter, commonly a gain with a feedback system. This is a technique used as a stability criterion in the field of classical control theory. The root locus plots the poles of the closed loop transfer function in the complex s plane as a function of a gain parameter

21 A graphical method that uses a special protractor called a ~~sprot~~ spirals was once used to determine

58 angles and draw root loci

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