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MATRIC NO: 17/ENG05/005

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COURSE CODE: EEE441

1.) Briefly explain the Root locus technique.

It is a graphical representation of the closed loop poles as a system parameter is varied. It gives the graphical representation of a system stability before presenting root locus.

The root locus plots the poles of the closed loop transfer function in the complex S-plane as a function of a gain parameter. The locus of the roots of the characteristic equation when gain is varied from zero to infinity is called Root Locus.

2.) Describe the use of Routh Hurwitz to find the stability of a closed loop system when:

a) entire row is zero on the Routh table

b) to determine the poles on the $j\omega$ axis.

a.) The routh equation is used for determining a continuous system stability for systems with an nth order characteristic equation of the form

$$a_n S^n + a_{n-1} S^{n-1} + \dots + a_1 S + a_0 = 0$$

S^n	a_n	a_{n-2}	a_{n-4}	...
S^{n-1}	a_{n-1}	a_{n-3}	a_{n-5}	...
S^{n-2}	b_1	b_2	b_3	...
S^{n-3}	C_1	C_2	C_3	...
S^{n-4}	...			

where $a_n, a_{n-1}, \dots$ are coefficients of the characteristic equation

also, $b_1 = \frac{a_{n-1} a_{n-2} - a_n a_{n-3}}{a_{n-1}}$, $b_2 = \frac{a_{n-1} a_{n-4} - a_n a_{n-5}}{a_{n-1}}$, $b_3 = \dots$

$C_1 = \frac{b_1 a_{n-3} - a_{n-1} b_2}{b_1}$, $C_2 = \frac{b_1 a_{n-5} - a_{n-1} b_3}{b_1}$, $C_3 = \dots$

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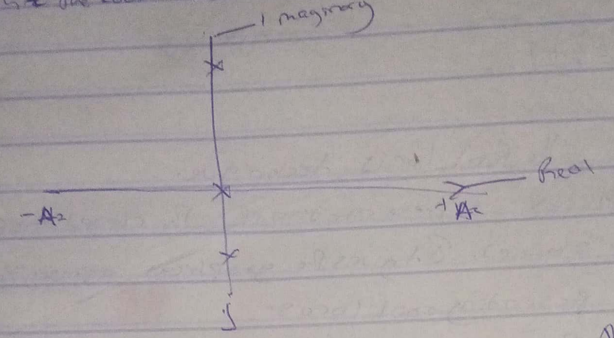
$C_1 = \frac{b_1 a_{n-3} - a_{n-1} b_2}{}$, $C_2 = \frac{b_1 a_{n-5} - a_{n-1} b_3}{b}$, C_3

Note: the table is continued until the value of zeros is obtained all through the last row



The roots are indicated on the imaginary axis. This makes the system marginally stable. Also due to the presence of the entire row of zeros, there are roots lying on the $j\omega$ axis.

b.) If the entries from the row before the row of the zeros to the last row in the Routh table are looking as the even polynomials and there are no sign changes, then all the poles there belong to the $j\omega$ axis.

Sometimes, the coefficient of the routh table in a whole row become zero and thus further calculation of the elements of the array is not possible. This occurs when there is a presence of a conjugate pole on the imaginary axis.

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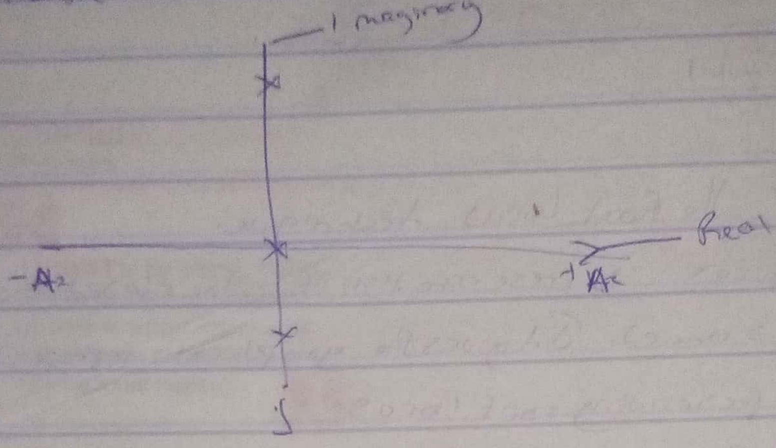

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