

Questions

1. Briefly explain the Root Locus Technique.
2. Describe the use of Routh Hurwitz to find the stability of a closed loop system when:
 - a) entire row is zero (0) on the Routh table.
 - b) to determine the poles on the jw axis.

Answers

1. The root locus technique is a graphical method for examining the changes of the roots of a system with variation of a certain system parameter, commonly a gain within a feedback system. It is used as a criterion of stability.

The root locus plots the poles of the closed loop transfer function in the complex s-plane as a function of a gain parameter.

Rules of the Root Locus

- i) The root locus starts from the open-loop poles 'k' and terminates on either finite open loop zero infinity.
- ii) The root locus is symmetrical about the real axis.

2. a) When the entire row is zero (0) on the Routh table:

This condition indicates that there are symmetrically located roots in the s-plane. To overcome this the following steps can be taken:

- i. An auxiliary polynomial is created from the row above the row of zero's skipping every other power of 's'.
- ii. Differentiate the auxiliary polynomial with respect to 's'.
- iii. The row of zero's is then replaced with the coefficients of the resulting polynomial.
- iv. The Routh table is then calculated as usual.
- v. The signs of the first column entries are then reevaluated.

b) To determine the poles on the jw axis:

They are determined by the system poles for the under-damped system the poles are

$$= \sigma \pm j\omega_0$$