4.1 CHARACTERISTIC EQUATION

The characteristic equation is nothing more than setting the denominator of the closed-loop transfer function to zero. In control theory, there are two main methods of analyzing feedback systems: the transfer function (or frequency domain) method and the state space method. The characteristic equation is the equation which is solved to find a matrix's eigenvalues, also called the characteristic polynomial. Characteristic equation is used to solve linear differential equations. Characteristic equations of auxiliary differential equations are used to solve a partial differential equation.

The properties of transfer function are given below:

- The ratio of Laplace transform of output to Laplace transform of input assuming all initial conditions to be zero.
- The transfer function of a system does not depend on the inputs to the system.
- The system poles and zeros can be determined from its transfer function.

Closed loop transfer function:

$$\frac{C(s)}{R(s)} = \frac{G(s)}{1 \pm G(s)H(s)}$$

Characteristic Equation:

$$1 \pm G(s)H(s) = 0$$