Bilad Alrafidain University College

Electric Power Techniques Engineering Department

Control Systems Analysis

Fourth Stage

Academic Year 2020 - 2021

Assistant Lecturer. Ibrahim Ismail

Control Systems Analysis

Course Contents

- Introduction to Control System.
- Transfer Function.
- Time Domain Analysis.
- Stability Analysis.
- Root Locus Method.
- Frequency Domain Analysis.
- Compensator Lead Network.
- Compensator Lag Network.
- PID Controllers.
- State Space Theory.
- State Space Representation.

Lecture Four

Transfer Function

Tutorial lecture about poles and zeros

Example 1: Find the Poles & Zeros for the following Transfer Function and then plot them on the (S-Plane)?

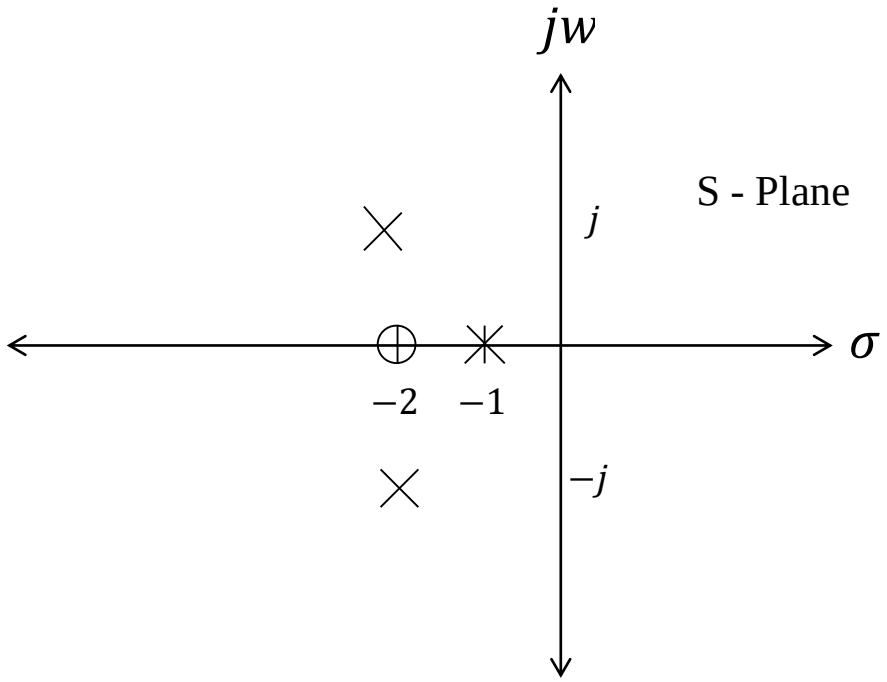
$$G(S) = \frac{(s+2)}{(s+1)(s+2+j)(s+2-j)}$$

Solution:

Zeros: $s = -2$

Poles: $s = -1, s = -2-j, s = -2+j$

Let us now draw the (Pole – Zero Diagram) which is a plot on (S-plane) represents the locations of Poles and Zeros of a Transfer Function. In the (Pole – Zero Diagram) the Poles are represented by (X) and the Zeros represented by (O).



Example 2: Find the Poles & Zeros for the following Transfer Function and then plot them on the (S-Plane)?

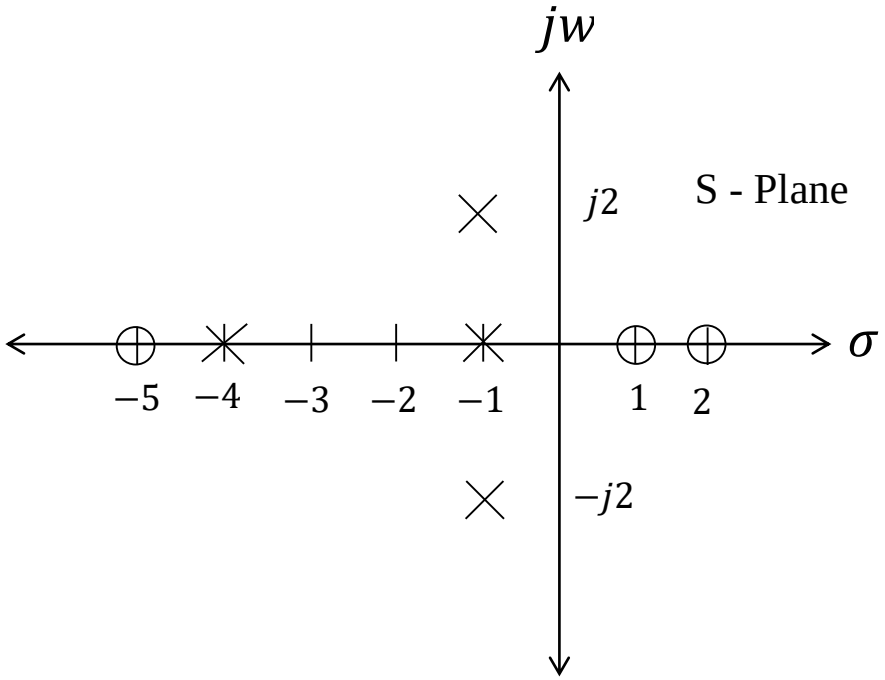
$$G(S) = \frac{(s-1)(s-2)(s+5)}{(s+4)(s+1+2j)(s+1-2j)}$$

Solution:

Zeros: $s = 1, s = 2, s = -5$

Poles: $s = -4, s = -1-2j, s = -1+2j$

Let us now draw the (Pole – Zero Diagram) which is a plot on (S-plane) represents the locations of Poles and Zeros of a Transfer Function. In the (Pole – Zero Diagram) the Poles are represented by (X) and the Zeros represented by (O).



Example 3: Find the Poles & Zeros for the following Transfer Function and then plot them on the (S-Plane)?

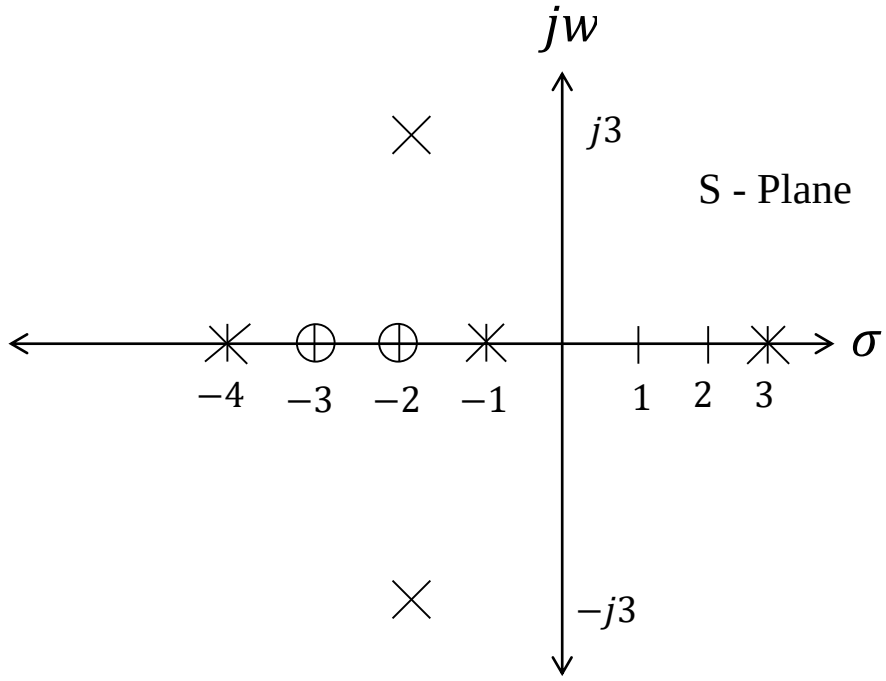
$$G(S) = \frac{(s+3)(s+2+3j)(s+2-3j)}{(s-3)(s+1)(s+4)}$$

Solution:

Zeros: $s = -3, s = -2-3j, s = -2+3j$

Poles: $s = 3, s = -1, s = -4$

Let us now draw the (Pole – Zero Diagram) which is a plot on (S-plane) represents the locations of Poles and Zeros of a Transfer Function. In the (Pole – Zero Diagram) the Poles are represented by (X) and the Zeros represented by (O).



Example 4: Find the Poles & Zeros for the following Transfer Function and then plot them on the (S-Plane)?

$$G(S) = \frac{(s+1)(s-2)(s+3)(s-4)}{(s-1)(s+2)(s-3)(s+4)}$$

Solution:

Zeros: $s = -1, s = 2, s = -3, s = 4$

Poles: $s = 1, s = -2, s = 3, s = -4$

Let us now draw the (Pole – Zero Diagram) which is a plot on (S-plane) represents the locations of Poles and Zeros of a Transfer Function. In the (Pole – Zero Diagram) the Poles are represented by (X) and the Zeros represented by (O).