Q1: Find equivalent digital plant transfer functions for the following analog plant transfer functions:

Verify the accuracy of approximation with sample time of 0.1s, 0.01s, and 0.001s, respectively, through comparing frequency responses.

A1: Using the Tustin approximation and with the help of MATLAB, the equivalent digital plant transfer functions are calculated as follows:

|  |  |  |  |
| --- | --- | --- | --- |
|  | T=0.1 | T=0.01 | T=0.001 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

The frequency response are plotted separately as follows, where triangle is 0.1s, circle is 0.01s, and star is 0.001s.