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EEEE2045:

Control Coursework

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Author:
George Downing

Student Number:
20273662

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2.1 Exercise 1

$$G_p(s) = \frac{a}{s+20} \tag{1}$$

$$\lim_{s \to 0} (G_p(s)) \tag{2}$$

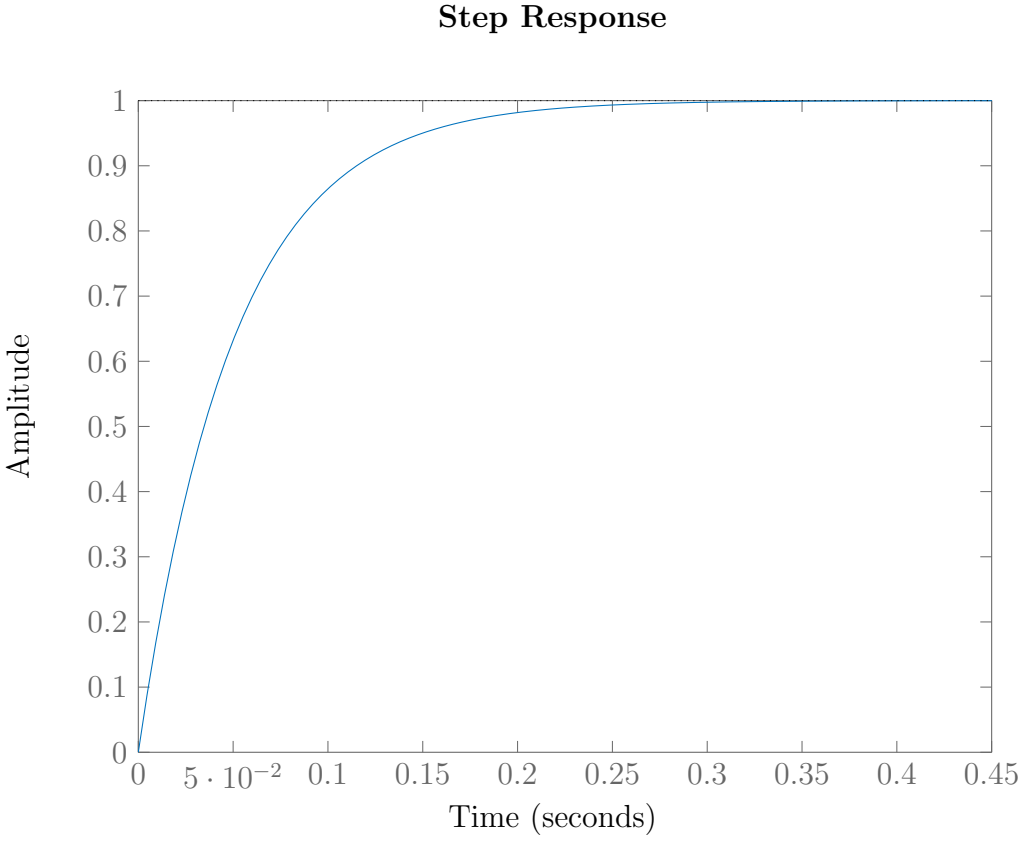

Figure 1: Graph showing step response of plant

The plant transfer function for a simple first order system is given by (1) where a is the gain of the system and s is the Laplace variable. Steady state is achieved when s approaches 0 as described by (2). Therefore the steady state gain of the system is $a/20$.

When $a = 10$ the steady state gain is $\frac{10}{20}$ which is 0.5.

Unity gain is achieved when the gain is equal to 1 at steady state. Hence the gain of the system is equal to 1 when $a = 20$. The step response of such system is shown in Figure 1.

The time constant is the time taken for the system to reach $1 - e^{-1}$ or approximately 63.2% of its final value. The time constant is equal to the reciprocal of the gain of the system. Hence the time constant is equal to 0.05 seconds when the $a = 20$. and 0.1 seconds when the $a = 10$.

2.2 Exercise 2

2.3 Exercise 3

2.4 Exercise 4a

2.5 Exercise 4b

2.6 Exercise 5

3 Design Questions and Solutions

4 Summary and Conclusions

References