Lab practice #08

Time Domain Analysis of Second order Systems

Subject: - Feedback Control Systems
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A Typical Second order system looks like

$$G(S) = \frac{\omega_n^2}{S^2 + 2\varsigma\omega_n S + \omega_n^2}$$

Where

ω_n is natural un-damped frequency

ς is damping ratio

Find the step response when

$\omega_n = 0.1$ rad/sec

$\varsigma = 0.2$

$$G(S) = \frac{\omega_n^2}{S^2 + 2\varsigma\omega_n S + \omega_n^2}$$

$$G(S) = \frac{0.01}{S^2 + 0.04S + 0.01}$$

Find the step response when

$\omega_n = 0.1$ rad/sec

$\varsigma = 0.5$

$$G(S) = \frac{\omega_n^2}{S^2 + 2\varsigma\omega_n S + \omega_n^2}$$

$$G(S) = \frac{0.01}{S^2 + 0.1S + 0.01}$$

Find the step response when

$\omega_n = 0.1$ rad/sec

$\varsigma = 0.2, 0.5, 0.81$ and 2.5.

$\varsigma = 0.2$ $\quad G(S) = \dfrac{0.01}{S^2 + 0.04S + 0.01}$

$\varsigma = 0.5$ $\quad G(S) = \dfrac{0.01}{S^2 + 0.1S + 0.01}$

$\varsigma = 0.81$ $\quad G(S) = \dfrac{0.01}{S^2 + 0.16S + 0.01}$

$\varsigma = 2.5$ $\quad G(S) = \dfrac{0.01}{S^2 + 0.5S + 0.01}$

Find the step response when

$\omega_n = 0.1, 0.2, 0.5$ and 1 rad/sec

$\varsigma = 0.2$

$\omega_n = 0.1$rad/sec $\quad G(S) = \dfrac{0.01}{S^2 + 0.04S + 0.01}$

$\omega_n = 0.2$ rad/sec $\quad G(S) = \dfrac{0.02}{S^2 + 0.08S + 0.02}$

$\omega_n = 0.5$ rad/sec $\quad G(S) = \dfrac{0.25}{S^2 + 0.2S + 0.25}$

$\omega_n = 1$ rad/sec $\quad G(S) = \dfrac{1}{S^2 + 0.4S + 1}$

Find the impulse response when

$\omega_n = 0.1$rad/sec

$\varsigma = 0.2, 0.5, 0.81$ and 2.5

$\varsigma = 0.2$ $\quad G(S) = \dfrac{0.01}{S^2 + 0.04S + 0.01}$

$\varsigma = 0.5$ $\quad aG(S) = \dfrac{0.01}{S^2 + 0.1S + 0.01}$

$\varsigma = 0.81$ $\quad G(S) = \dfrac{0.01}{S^2 + 0.16S + 0.01}$

$\varsigma = 2.5$ $\quad G(S) = \dfrac{0.01}{S^2 + 0.5S + 0.01}$

Find the ramp response when

$\omega_n = 0.1$rad/sec

$\varsigma = 0.2, 0.5, 0.81$ and 2.5

$\varsigma = 0.2$ $$G(S) = \frac{0.01}{S^2 + 0.04S + 0.01}$$

$\varsigma = 0.5$ $$G(S) = \frac{0.01}{S^2 + 0.1S + 0.01}$$

$\varsigma = 0.81$ $$G(S) = \frac{0.01}{S^2 + 0.16S + 0.01}$$

$\varsigma = 2.5$ $$G(S) = \frac{0.01}{S^2 + 0.5S + 0.01}$$

Find the impulse response when

$\omega_n = 0.1, 0.2, 0.5$ and 1 rad/sec

$\varsigma = 0.2$

$\omega_n = 0.1$rad/sec $\quad G(S) = \dfrac{0.01}{S^2 + 0.04S + 0.01}$

$\omega_n = 0.2$ rad/sec $\quad G(S) = \dfrac{0.02}{S^2 + 0.08S + 0.02}$

$\omega_n = 0.5$ rad/sec $\quad G(S) = \dfrac{0.25}{S^2 + 0.2S + 0.25}$

$\omega_n = 1$ rad/sec $\quad G(S) = \dfrac{1}{S^2 + 0.4S + 1}$

Find the ramp response when

ω_n= 0.1, 0.2, 0.5 and 1 rad/sec

ς = 0.2

$\omega_n = 0.1$rad/sec $\quad G(S) = \dfrac{0.01}{S^2 + 0.04S + 0.01}$

$\omega_n = 0.2$ rad/sec $\quad G(S) = \dfrac{0.02}{S^2 + 0.08S + 0.02}$

$\omega_n = 0.5$ rad/sec $\quad G(S) = \dfrac{0.25}{S^2 + 0.2S + 0.25}$

$\omega_n = 1$ rad/sec $\quad G(S) = \dfrac{1}{S^2 + 0.4S + 1}$