X

reviewer3@nptel.iitm.ac.in ▼

Courses » **Control System Design**   Announcements   **Course**   Ask a Question   Progress   FAQ

Unit 13 - Week 8 : Quantitative feedback theory (Part 2/2)

Course outline

How to access the portal

Prerequisite Assignment

MATLAB Download and Introduction

MATLAB Learning Modules

Week 1: Linear System Theory, Fourier and Laplace Transforms

Week 2: Introduction to feedback control, Nyquist stability theory

Week 3 : Bode plots, Steps for performing control design, General controllers

Week 4: Bode-plot and root-locus based control design

Week 5: Control of systems with some known parameters, Introduction to 2-degree of freedom control

Week 6: 2-Degree of freedom control

Week 8 Assessment

The due date for submitting this assignment has passed. **Due on 2018-09-26, 23:59 IST.**
As per our records you have not submitted this assignment.

1) What is the role of Controller and Pre-filter in Nichols plot based 2-DOF control system design?   ***1 point***

○ C(s) restricts the spread in the closed-loop response $\delta(j\omega)$ and F(s) is designed to obtain the desired nominal response.

○ F(s) restricts the spread in the closed-loop response $\delta(j\omega)$ and C(s) is designed to obtain the desired nominal response.

○ Both C(s) and F(s) together restrict the spread in the closed-loop response which results in the desired nominal response.

○ Both C(s) and F(s) are designed to obtain the desired nominal response which in turn restricts the spread in the closed-loop response $\delta(j\omega)$.

No, the answer is incorrect.
Score: 0

Accepted Answers:
C(s) restricts the spread in the closed-loop response $\delta(j\omega)$ and F(s) is designed to obtain the desired nominal response.

2) Which of the following statements define plant template for a plant whose gain and one pole location are uncertain?   ***1 point***

○ The region in the Nichols plot occupied by the plant's transfer function $P(j\omega)$ at a given frequency ω for all possible variations in the gain and pole of P is called plant template.

○ The region in the Nichols plot occupied by a plant at a given frequency for all possible variations in its gain alone is called the plant template.

○ The region in the Nichols plot occupied by a plant at a given frequency for all possible variations in its pole location alone is called the plant template.

○ The union of regions in the Nichols plot occupied by the frequency ω is swept from 0 to ∞

No, the answer is incorrect.
Score: 0

Accepted Answers:
The region in the Nichols plot occupied by the plant's transfer function $P(j\omega)$ at a given frequency ω for possible variations in the gain and pole of P is called plant template.

3)   ***1 point***

The transfer function of a plant is given as $P(s) = \dfrac{K}{s(\dfrac{s}{p} + 1)}$. The nominal value of K is 10 and it varies between 1 and 20. Similarly the nominal value of p is 2 and it varies between 1 and 4 respectively. Identify the plant template at $\omega = 1 rad/s$ from below:

○

○

○

○

No, the answer is incorrect.

Score: 0

Accepted Answers:

4) At what frequency does the shape of the plant template become a vertical straight line?   *1 point*

○

At a frequency where upper value of the transmission function $(T_{upper}(s))$ drops down to -20dB.

○

At any frequency much higher than the corner frequencies of the plant.

○

At a frequency where the permissible spread between upper and lower transmission functions is 3.5 dB.

○

At any frequency close to the corner frequencies of the plant.

No, the answer is incorrect.

Score: 0

Accepted Answers:

At any frequency much higher than the corner frequencies of the plant.

5) Till what frequency should one restrict the permissible spread between the upper and lower   *1 point*
bounds $\delta(j\omega)$?

○

Till the frequency where nominal value of the transmission function $(T_{nominal}(s))$ rises to +20dB.

○

Till the frequency where nominal value of the transmission function $(T_{nominal}(s))$ drops down to -20dB.

○

Till the frequency where upper value of the transmission function $(T_{upper}(s))$ rises to +20dB.

○

Till the frequency where upper value of the transmission function $(T_{upper}(s))$ drops down to -20dB.

No, the answer is incorrect.

Score: 0

Accepted Answers:
Till the frequency where upper value of the transmission function $(T_{upper}(s))$ drops down to -20dB.

6) What should approximately be the structure of the nominal transmission function's transfer   *1 point*
function?

○ A general second order system because of the location of requisite dominant closed loop poles.

○ A general second order system cascaded with a pole near origin.

○ A general first order system.

○ A general first order system cascaded with a pole near the origin.

No, the answer is incorrect.
Score: 0

Accepted Answers:
A general second order system because of the location of requisite dominant closed loop poles.

7) What does the robust tracking bound on loop gain at a given frequency in the Nichols plot   *1 point*
indicate?

○ The region above which the plant template gain lies such that the permissible spread between
the upper and lower transmission functions are met.

○ The region above which the nominal lies such that the permissible spread between the upper
and lower transmission functions are met.

○ The region above which the nominal plant lies.

○ It is the region traced by the open loop transfer function when the gain and phase of the plant
varies.

No, the answer is incorrect.
Score: 0

Accepted Answers:
*The region above which the nominal lies such that the permissible spread between the upper and l
transmission functions are met.*

8)
The transmission function of a system is given by $T = \dfrac{L}{1 + L}$ where L is open-loop gain.   *0 points*

Identify the phase margin Φ (Hint : |L|=1 at gain cross-over frequency)

○ $\Phi = 40°$

○ $\Phi = 60°$

○ $\Phi = 30°$

○ $\Phi = 35°$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\Phi = 40°$

9) Identify the width of the stability bound w_d using the plant template obtained in Q3.   *1 point*

○ 120°

○ 123°

○ 143.12°

○ 111°

No, the answer is incorrect.
Score: 0

Accepted Answers:
111°

10) For the plant specified in Q3 a controller $C_1(s)$ ensures that the plant template at   *1 point*
$\omega = 1 rad/s$ is shifted to new region (shown in red). Similarly another controller $C_2(s)$ ensures that the
plant template at $\omega = 1 rad/s$ is shifted to new region (shown in green). Identify
$C_1(j1) and C_2(j1)$ from below:

○ $C_1(j1) = -j10$ and $C_2(j1) = -0.1 + j0.1$

○

$C_1(j1) = -0.1 + j0.1 \ and \ C_2(j1) = -j10$

○

$C_1(j1) = 0.5 + j1 \ and \ C_2(j1) = 0.5 + j0.75$

○

$C_1(j1) = 2 + j3 \ and \ C_2(j1) = 3 + j7$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$C_1(j1) = -j10 \ and \ C_2(j1) = -0.1 + j0.1$

Previous Page   End

f

y

▶

in

g+

© 2014 NPTEL - Privacy & Terms - Honor Code - FAQs -

A project of

NPTEL National Programme on Technology Enhanced Learning

In association with

NASSCOM®

Funded by

Government of India
Ministry of Human Resource Development

Powered by

Google™