Unit 7 - Week 3 : Bode plots, Steps for performing control design, General controllers

Week-3 Assessment

The due date for submitting this assignment has passed. **Due on 2018-09-05, 23:59 IST.**
As per our records you have not submitted this assignment.

Week-3 Assessment

1) Obtain gain margin (GM) & phase margin (PM) for an open-loop transfer function G(s) from the given Nyquist plot. ***1 point***

- $PM = 30°, GM = 10\ dB$
- $PM = 60°, GM = 10\ dB$
- $PM = -30°, GM = 10\ dB$
- $PM = -60°, GM = -10\ dB$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$PM = 30°, GM = 10\ dB$

2) Identify the open-loop transfer function G(s) of the system whose asymptotic Bode magnitude plot is shown in figure 2. ***1 point***

- $G(s) = \frac{100(s+1)}{s(\frac{s}{100}+1)}$
- $G(s) = \frac{10(s+1)}{s(\frac{s}{100}+1)}$
- $G(s) = \frac{10(\frac{s}{10}+1)}{s(\frac{s}{100}+1)}$
- $G(s) = \frac{100(\frac{s}{10}+1)}{s(\frac{s}{100}+1)}$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$G(s) = \frac{10(\frac{s}{10}+1)}{s(\frac{s}{100}+1)}$$

3) Figure 3 shows the asymptotic Bode magnitude plot of an open-loop transfer function G(s). Find the value of gain cross-over frequency ω_{gc} in rad/s (up to 2 significant digits)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 30,32

1 point

4) If the step response of a system shows peak overshoot M_p = 40 % & rise time $t_r = 5/3\ s$ then determine the approximate closed-loop transfer function T(s) of the system *1 point*

- $T(s) = \frac{1}{s^2+0.56s+1}$
- $T(s) = \frac{1}{s^2+0.14s+1}$
- $T(s) = \frac{1}{s^2+0.28s+1}$
- $T(s) = \frac{1}{s^2+2s+1}$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$T(s) = \frac{1}{s^2+0.56s+1}$$

5) The closed-loop transfer function of a unity feedback system is given by *1 point*
$T(s) = \frac{\omega_n^2}{s^2+2\zeta\omega_n s+\omega_n^2}$. Given the closed-loop bandwidth $\omega_b = 1.5\ rad/s$. Find the value of ζ & ω_n from the frequency response of T(s) as shown in figure 4. (Hint: $\omega_r \approx \omega_n$)

- $\zeta = 0.2, \omega_n = 1\ rad/s$
- $\zeta = 0.1, \omega_n = 1\ rad/s$
- $\zeta = 0.3, \omega_n = 1\ rad/s$
- $\zeta = 0.4, \omega_n = 1\ rad/s$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$\zeta = 0.1, \omega_n = 1\ rad/s$

6) From the plots given below, identify the Bode magnitude plot of the open-loop transfer function G(s) which rejects sinusoidal disturbance of frequency 10 rad/s by at least 99% *1 point*

No, the answer is incorrect.
Score: 0

Accepted Answers:

7) The closed-loop control system (as shown in figure 5) is expected to track a DC reference perfectly. Which of the following arguments will have to hold for the open-loop transfer function C(s)P(s)? **1 point**

- C(s)P(s) should have at least one pole at the origin
- C(s)P(s) should have at least one zero at the origin
- C(s)P(s) should have a pair of imaginary poles
- Both option a & c

No, the answer is incorrect.
Score: 0

Accepted Answers:
C(s)P(s) should have at least one pole at the origin

8) The Bode magnitude plot of a transfer function C(s) is shown in figure 6. Which of the following controller have such a magnitude plot? **1 point**

- Proportional controller
- Lag compensator
- Proportional integral (PI) controller
- Proportional derivative (PD) controller

No, the answer is incorrect.
Score: 0

Accepted Answers:
Proportional integral (PI) controller

9) The problem of integrator wind-up can be addressed by which of the following measures? **1 point**

i. By re-initializing the integral action to a desired value
ii. By increasing the set point in a suitable ramp
iii. By preventing the integral term from accumulating above or below pre-determined bounds

- i & ii
- i & iii
- ii & iii
- All the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
All the above

10)The transfer function of a compensator is given as C(s) = (s/a + 1)/(s/b + 1) where a and b are positive real numbers. The condition for this controller to act as a lead compensator is **1 point**

- a > b
- ab < 1
- ab > 1
- a < b

No, the answer is incorrect.
Score: 0

Accepted Answers:

$a < b$

Previous Page

End