Week 9 - Assessment

The due date for submitting this assignment has passed. **Due on 2018-10-03, 23:59 IST.**
As per our records you have not submitted this assignment.

1) The loop gain \( L \) of a unity feedback system is

\[
L(s) = \frac{1}{\left(\frac{s}{100} + 1\right)\left(\frac{s}{200} + 1\right)\left(\frac{s}{300} + 1\right)}
\]

Further, it is given that, \( \oint_{C_1 + C_2} \ln S ds = 0 \) where \( S \) is the sensitivity function and \( C \) is closed curve in the s-plane shown below:

Identify the correct equation.

- \( \int_{C_2} \ln S ds = \pi \)
- \( \int_{C_1} \ln S ds = 2\pi \)
- \( \int_{0}^{\infty} \ln |S| d\omega = 0 \)
- \( \int_{0}^{\infty} S ds = 0 \)

No, the answer is incorrect.

Score: 0

Accepted Answers:

- \( \int_{0}^{\infty} \ln |S| d\omega = 0 \)

2) The natural logarithm of the sensitivity function \( S \) as a function of frequency(\( \omega \)) for a minimum-phase, stable system is shown below:

Calculate the value of \( \int_{\pi}^{\infty} \ln |S| d\omega : \)

- \( \pi/2 \)
- \( \pi \)
- \( 3\pi/2 \)
- \( 0 \)

No, the answer is incorrect.

Score: 0

Accepted Answers:
The Bode plot for the open loop gain of a unity feedback system is shown below:

Identify the approximate values of open-loop phase for $\omega \ll 10$ and $\omega \gg 10$.

- $0$ and $-\pi$ respectively.
- $0$ and $-\pi/2$ respectively.
- $-\pi/2$ and $-\pi$ respectively.
- $-\pi$ and $-\pi/2$ respectively.

No, the answer is incorrect.
Score: 0
Accepted Answers:
0 and $-\pi$ respectively.

4) Calculate the approximate value of open-loop phase at $\omega = 1\text{ rad/s}$ for the system specified in Q3.

- $-\frac{3}{5\pi}$
- $\frac{2}{5\pi}$
- $-\frac{2}{3\pi}$
- $-\frac{2}{5\pi}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$-\frac{2}{5\pi}$

5) What information does the ideal bode characteristic plot give?

- The minimum necessary gain and phase margins.
- The maximum possible gain cross-over frequency.
- The minimum possible gain cross-over frequency.
- The optimal relative degree of the loop gain.

No, the answer is incorrect.
Score: 0
Accepted Answers:
The minimum possible gain cross-over frequency.

6) The open-loop magnitude for a plant $P(s)$ has to be maintained at 40 dB for frequency $\omega \leq 10\text{ rad/s}$. Further, it is required that the phase margin should be $\frac{\pi}{4}$. Calculate the minimum value of open-loop magnitude for $10\text{ rad/s}$.

- $30\text{ rad/s}$
- $107\text{ rad/s}$
- $39\text{ rad/s}$
- $76\text{ rad/s}$
7) Identify the ideal bode characteristic for the loop gain \( L(s) = CP(s) \) obtained in Q6 from the options given below:

No, the answer is incorrect.
Score: 0
Accepted Answers:

8) In a certain feedback control system, it is desired to maintain the loop gain constant at 75 dB up to 43 rad/s. The phase margin of the system should be 40° and gain margin should be 10 dB. Determine the value of requisite roll-off (in dB/decade) after 43 rad/s that would lead to minimum gain cross-over frequency.

-31.11 dB/decade
31.11 dB/decade
-41.11 dB/decade
-15.55 dB/decade

No, the answer is incorrect.
Score: 0
Accepted Answers:

9) For Q8, find out the frequency \( \omega_c \) till which the slope should be maintained to obtain the required Gain margin.

65.0 \( \times 10^3 \) rad/s
75.2 \( \times 10^3 \) rad/s
20.8 \( \times 10^3 \) rad/s
11.6 \( \times 10^3 \) rad/s

No, the answer is incorrect.
Score: 0
Accepted Answers:

10) In Q8, if high frequency roll-off is -100 dB/decade then calculate the minimum frequency \( \omega_2 \) up to which loop shape will have to be preserved.

37.5 \( \times 10^3 \) rad/s
37.2 \( \times 10^3 \) rad/s
45.2 \( \times 10^3 \) rad/s
54.2 \( \times 10^3 \) rad/s
No, the answer is incorrect.
Score: 0
Accepted Answers:
$37.2 \times 10^3 \text{ rad/s}$