Class Test No. 11 Friday 03rd Oct 2019 Duration: 10 Minutes Closed notes

Name: _____ Roll No. _____

Choose only one option which is the most appropriate for questions 1 - 5.

1. Phase lag, employed for calculation of phase margin, is positive when measured

(a) anti-clockwise from positive real axis
(b) clockwise from negative real axis
(c) clockwise from positive real axis
(d) anti-clockwise from negative real axis

2. If the gain of a stable minimum phase plant is increased, phase margin normally will

(a) increase
(b) decrease
(c) remain unaltered
(d) be undefined

3. Systems with infinite phase margin always have

(a) no phase crossover
(b) no gain crossover
(c) zero gain margin
(d) infinite gain margin

4. In the context of Nyquist plot, phase margin is defined as the angle between the phasor from the origin of G-plane to -1+j0 and the phasor from

(a) -1+j0 to the plot intersection point with negative real axis
(b) -1+j0 to the plot intersection point with unit circle
(c) G-plane origin to the plot intersection point with unit circle
(d) G-plane origin to the plot intersection point with the negative real axis

5. In the context of Nyquist plot, gain margin is determined from location of its

(a) intersection with negative real axis in relation to -1+j0
(b) intersection with negative imaginary axis in relation to -1+j0
(c) intersection with positive real axis in relation to G-plane origin
(d) intersection with negative real axis in relation to unit circle

Give short (1 - 2 lines) answer to the questions 6-10

6. When do we say that the gain and phase margins are positive for a stable minimum phase plant?

We say that gain and phase margins are positive when at GCO the phase angle magnitude is less than 180^o and at PCO the gain is less than 1.

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7. How do the gain and phase margins relate in an overall sense, to the real part 'σ' of 2nd order dominant poles of a closed loop system?

In an overall sense, gain margin relates to ω_n while phase margin relates to ζ, where $\sigma = \zeta\omega_n$.

8. What is the basic advantage and main drawback of systems having infinite gain margin?

Basic advantage of infinite gain margin is that we can significantly improve the tracking performance by increasing gain, while drawback is the worsening of transient response.

9. Define gain margin in the Nyquist context.

Gain margin, in Nyquist context, is the reciprocal of the length of the phasor from origin to the intersection point of Nyquist plot with negative real axis.

10. Give the gain and phase margins of the plant given alongside. $G(s) = \frac{(s-1)}{(s+1)}$

GM = 0, PM = 0 (Both PCO and GCO are '0').