1. Which of the following is NOT an approach to system design?

a) Trial and error
b) Analytical synthesis
c) Genetic algorithm optimization
d) Random selection

Answer: d) Random selection

Explanation: System design typically involves structured processes such as trial and error, analytical synthesis, and optimization techniques like genetic algorithms. Random selection lacks a systematic approach to designing systems.

2. Which compensation technique involves adjusting the gain of a system to achieve desired performance?

a) Phase compensation
b) Frequency compensation
c) Gain compensation
d) Time compensation

Answer: c) Gain compensation

Explanation: Gain compensation involves adjusting the gain of a system to achieve desired performance characteristics without altering the system dynamics significantly.

3. In the time domain, which compensator primarily addresses phase lag in a system?

a) Phase-lag compensator
b) Phase-lead compensator
c) Phase-lag-lead compensator
d) Phase-delay compensator

Answer: a) Phase-lag compensator

Explanation: Phase-lag compensators introduce additional phase lag to the system, primarily addressing phase lag issues in the time domain.

4. Which controller type is effective in reducing steady-state error in a system?

a) Proportional controller
b) Derivative controller
c) Integral controller
d) Composite controller

Answer: c) Integral controller

Explanation: Integral controllers integrate the error signal over time, effectively reducing steady-state error in the system.

5. Which compensator is designed to enhance system stability by introducing phase advance in the frequency domain?

a) Phase-lag compensator
b) Phase-lead compensator
c) Phase-delay compensator

d) Phase-advance compensator

Answer: b) Phase-lead compensator

Explanation: Phase-lead compensators introduce phase advance in the frequency domain, enhancing system stability and improving transient response.

6. What is the primary purpose of a derivative controller in a control system?

a) To eliminate steady-state error
b) To enhance system stability
c) To improve transient response
d) To reduce overshoot

Answer: d) To reduce overshoot

Explanation: Derivative controllers anticipate future behavior based on the rate of change of the error signal, helping to reduce overshoot in the system response.

7. Which compensation technique adjusts the phase response of a system without significantly affecting the magnitude response?

a) Phase compensation
b) Magnitude compensation
c) Gain compensation
d) Phase-gain compensation

Answer: a) Phase compensation

Explanation: Phase compensation techniques primarily focus on adjusting the phase response of a system while minimally affecting the magnitude response.

8. What type of compensator combines characteristics of both phase-lag and phase-lead compensators?

a) Phase-lag-lead compensator
b) Phase-lag compensator
c) Phase-lead compensator
d) Phase-delay compensator

Answer: a) Phase-lag-lead compensator

Explanation: Phase-lag-lead compensators combine characteristics of both phase-lag and phase-lead compensators to address specific system requirements effectively.

9. Which controller type operates based on the current error signal without considering past or future error values?

a) Proportional controller
b) Derivative controller
c) Integral controller
d) Composite controller

Answer: a) Proportional controller

Explanation: Proportional controllers act based on the current error signal proportionally to the desired output, without considering past or future error values.

10. In which domain are phase-lead compensators primarily designed and analyzed?

a) Time domain
b) Frequency domain
c) Laplace domain
d) State-space domain

Answer: b) Frequency domain

Explanation: Phase-lead compensators are primarily designed and analyzed in the frequency domain to understand their effects on the system’s phase and magnitude responses.

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