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Continuing Education Course #182  
Feedback Control System Fundamentals

1. In feedback control, the state of a physical system or device is measured by a \_\_\_\_\_?
  - a. Plant
  - b. Controller
  - c. Process
  - d. Sensing system
  
2. Feedback compares the measured and desired \_\_\_\_\_ to determine an error.
  - a. State
  - b. Controller
  - c. Sensor response
  
3. The basic elements of a control loop are?
  - a. Plant and Controller
  - b. Plant and Feedback Sensor
  - c. Controller and Feedback Sensor
  - d. Plant, Controller, and Feedback Sensor
  
4. The dynamics of a control loop block can be expressed in the \_\_\_\_\_ domain?
  - a. Time
  - b. Time and Frequency
  - c. Frequency
  - d. None of the above
  
5. Time domain analysis uses a set of \_\_\_\_\_ to describe the dynamics of each block?
  - a. Differential equations including non-linear terms
  - b. Controllers
  - c. Frequency domain transfer functions
  - d. Algebraic equations
  
6. The \_\_\_\_\_ will convert a differential equation to an algebraic frequency dependent transfer function between the inputs and output?
  - a. Feedback sensor
  - b. Controller
  - c. LaPlace Transform
  - d. Process
  
7. For frequency domain analysis the LaPlace variable is equated to?
  - a.  $s = \sigma + j\omega$
  - b.  $s = \sigma$

- c.  $s=j\omega$
- d. none of the above

8. The control loop response from the command input to the output is termed?

- a. The compliance
- b. The open loop transfer function
- c. The sensitivity function
- d. The closed loop transfer function

9. The control loop response from the disturbance input to the output is termed?

- a. The compliance
- b. The open loop transfer function
- c. The sensitivity function
- d. The closed loop transfer function

10. The open loop transfer function gain is primarily a function of the \_\_\_\_\_ gain?

- a. Plant
- b. Control compensator
- c. Feedback
- d. None of the above

11. A Type 1 system will have zero steady state error to a \_\_\_\_\_ input

- a. Step
- b. Ramp
- c. Parabolic
- d. All of the above

12. The Routh stability criterion provides information on the loop stability margins?

- a. True
- b. False

13. The Bode stability criteria provides \_\_\_\_\_ stability margins

- a. gain
- b. phase
- c. frequency
- d. a and b

14. The phase crossover frequency occurs when the OLTF phase equals?

- a. 1
- b.  $-90^\circ$
- c.  $-180^\circ$
- d.  $90^\circ$

15. The gain crossover frequency occurs when the OLG equals one?

- a. True
- b. False

16. The Bode stability criteria are valid only for CLTF that are \_\_\_\_\_?

- a. Non-minimum phase
- b. Minimum phase

- c. Ratio of first order polynomials  
 d. Ratio of second order polynomials
17. The Nyquist stability criteria are valid for CLTF that are \_\_\_\_\_?
- a. Non-minimum phase  
 b. Minimum phase  
 c. Ratio of first order polynomials  
 d. a and b
18. In the frequency domain, minimum gain and phase stability margins and loop bandwidth are normally included in the control loop performance specification
- a. True  
 b. False
19. The loop shaping design example in section 7.1 used what two design criteria?
- a. phase margin and gain crossover frequency  
 b. gain margin and bandwidth  
 c. rise time and gain margin  
 d. none of the above
20. For the loop shaping design example in section 7.1, the control loop design resulted in what loop Type?
- a. 0  
 b. 1  
 c. 2  
 d. 3
21. In section 8 the Home Heating System example, the response of the system to two types of controllers was analyzed which were?
- a. phase lead and proportional  
 b. phase lag and proportional  
 c. lead lag and proportional  
 d. proportional and proportional plus integral
22. The first motion control example in section 9.3 analyzed a \_\_\_\_\_ only feedback design?
- a. Rate  
 b. Position  
 c. Acceleration  
 d. Torque
23. The second motion control example in section 9.3 used position and rate feedback for control?
- a. True  
 b. False
24. The \_\_\_\_\_ transformation can be used to transform a variable in the continuous frequency LaPlace s-domain to one in the sampled data z-domain.
- a. Fourier  
 b. Bi-linear  
 c. Zero Order  
 d. Bode
25. When comparing the stability margins in the continuous s-domain and sampled z-domain for the first motion control example with position feedback only, the net result was \_\_\_\_\_ margin due to sampling.

- a. an increase in phase and decrease in gain
- b. no change in phase and gain
- c. an decrease in both phase and gain
- d. an increase in both phase and gain

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