Continuing Education Course #291
Proportional, Integral, and Derivative
Controller Design - Part 1

1. The PID controller is the sum of how many terms?
- ○ a. 1
- ○ b. 2
- ○ c. 3

2. The proportional term?
- ○ a. sets the loop gain
- ○ b. integrates the error
- ○ c. differentiates the error

3. The integral term?
- ○ a. sets the loop gain
- ○ b. integrates the error
- ○ c. differentiates the error

4. The derivative term?
- ○ a. sets the loop gain
- ○ b. integrates the error
- ○ c. differentiates the error

5. The basic elements of a control loop are?
- ○ a. Plant and Controller
- ○ b. Controller and Feedback Sensor
- ○ c. Plant, Controller, and Feedback Sensor

6. In the basic feedback control loop block diagram the symbols for the plant and controller are?
- ○ a. P plant and H controller
- ○ b. C plant and H controller
- ○ c. P plant and C controller

7. The PID is a specific type of?
- ○ a. plant
- ○ b. controller
- ○ c. feedback sensor

8. Each block of the control loop can be represented in the?
- ○ a. time domain
- ○ b. frequency domain
- ○ c. both

9. The transform often used to convert between the continuous time and frequency domains is?
- a. Bode
- b. Nyquist
- c. Laplace

10. The control loop frequency response can be analyzed using?
- a. Bode Plots and Analysis
- b. Nyquist Plots and Analysis
- c. both

11. Bode frequency plots are used to analyze the?
- a. Plant frequency response
- b. Controller frequency response
- c. The OLTF and CLTF frequency response

12. Key stability criteria derived from Bode and Nyquist plots are?
- a. gain margin
- b. phase margin
- c. both

13. The control loop gain is primarily set by the?
- a. plant
- b. controller
- c. feedback sensor

14. The control loop response from the command input to the output is termed?
- a. The open loop transfer function
- b. The sensitivity function
- c. The closed loop transfer function

15. The open loop transfer function gain is primarily a function of the _____ gain?
- a. Plant
- b. Controller
- c. Feedback

16. Increasing a PID proportional gain KP will?
- a. decrease rise time
- b. increase rise time
- c. have no effect

17. Increasing a PID integral gain KI will?
- a. decrease overshoot
- b. increase overshoot
- c. have no effect

18. Increasing a PID derivative gain KD will?
- a. decrease overshoot
- b. increase overshoot
- c. have no effect

19. The PID controller works best with?

○ a. plants with very long delays
○ b. complex plants with high order dynamics
○ c. simple plants with step response similar to that of a first order system

20. There are two standard PID forms, one parameterized in terms of absolute gain and the other a proportional gain and time related to integration and differentiation. Parameter equivalence between structures is related as?
○ a. $\{K_P, K_I, K_D\}$ <-> $\{K_P, K_P/T_I, K_P*T_D\}$
○ b. $\{K_P, K_I, K_D\}$ <-> $\{K_P, K_P*T_I, K_P/T_D\}$
○ c. $\{K_P, K_I, K_D\}$ <-> $\{K_P, T_I, T_D\}$

21. The PI*PD configuration uses a?
○ a. PI controller in cascade with PD controller operating in forward path on the error
○ b. PI controller in forward path operating on error between output PD controller in feedback path and command input
○ c. forward path sum of PI and PD controllers in tandem

22. The PIPD configuration uses?
○ a. PI controller in cascade with PD controller operating in forward path on the error
○ b. PI controller in forward path operating on error between PD controller in output feedback path and command input
○ c. forward path sum of PI and PD controllers in tandem

23. The most well-known PID tuning methods are?
○ a. Fourier transform
○ b. Laplace transform
○ c. Ziegler and Nichols tuning methods

24. An issue with the PID derivative term is?
○ a. windup
○ b. noise amplification
○ c. there are not any issues

25. An issue with the PID integral term is?
○ a. windup
○ b. noise amplification
○ c. there are not any issues