**Instructor’s Guide**

**CHAPTER PROBLEMS ANSWER KEY**

**CHAPTER 1**

1. motion; process (or open-loop; closed-loop)

2. *Motion Control:* Servos or Servomechanisms

*Process Control:* Instrumentation

*Batch Process:* Sequential Process

3. negative

4. *Motion Control Process Control*

position temperature

speed flow rate

acceleration pressure

5. *Motion Control Process Control*

Hall-effect speed sensor float

6. b.

7. c.

8. True

9. *feedback signal*

10. The prescribed input value that indicates the desired operating point of the manufacturing process

11. error; error

12. True

13. b.; a.

14. *actuator*

15. d.

16. d.

17. d.

18. False

19. True

20. a.; b.; c.; e.

21. True

22. a.; b.

23. b.

24. a.; b.

**CHAPTER 2**

1. RF/RIN = 5K/1K = 5

2. −18V

3. +2.4V

4. minimum

5. square wave

6. *hysteresis*

7. a. < ; b. = ; c. >

8. −2

9. It determines whether one binary number is greater than, less than, or equal to the other binary number.

10. Optoisolation is the transfer of signals between separate circuits that operate at different voltages by means of an optical emitter and detector.

11. reverse

12. input

13. 25 = 32 − 1 = 31 ; 15V / 31 = 0.4838V

14. 8.4V

15. 25= 32 − 1 = 31 ; 10V / 31 = 0.3225V

16. 8

17. 2.56

18. 60%

19. high

20. Place a diode across RB with the cathode lead connected to pin 6 and the anode lead to pin 7.

21. 

22. T = 1.1RC = 1.1(2KΩ × 1μfd) = 2.2 ms