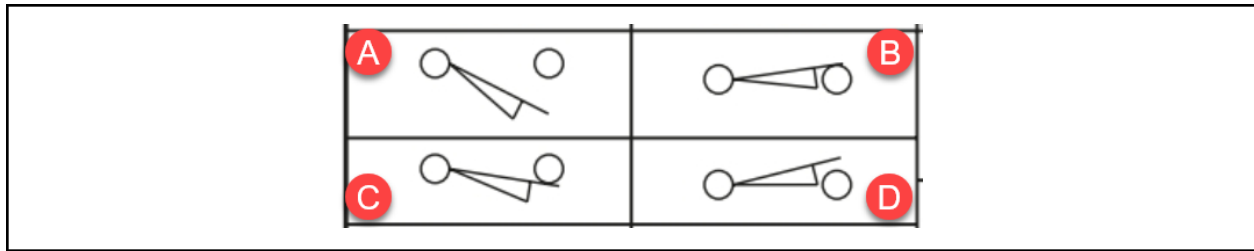
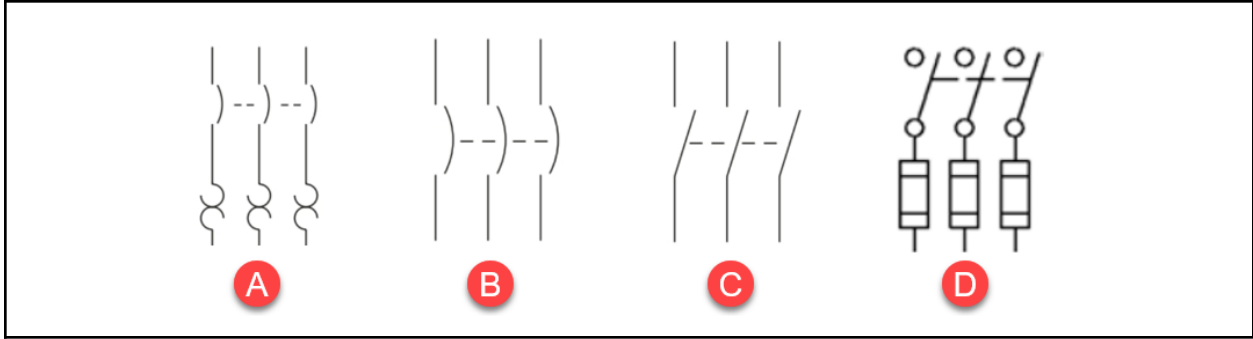


Question Pool 1: Symbols:



1. Which one of these symbols would be for a Normally-closed, held open type of limit switch?
 - a. A
 - b. B
 - c. C
 - d. D**
2. Which one of these symbols would be for a Normally-open, held closed type of limit switch?
 - a. A
 - b. B
 - c. C**
 - d. D
3. Which one of these symbols would be for a Normally-closed type of limit switch?
 - a. A
 - b. B**
 - c. C
 - d. D
4. The electrical symbol marked with “C” is a:
 - a. Normally open
 - b. Normally open, held closed**
 - c. Normally closed
 - d. Normally closed, held open
5. The electrical symbol marked with “A” is a:
 - e. Normally open**
 - f. Normally open, held closed
 - g. Normally closed
 - h. Normally closed, held open



6. Which one of these symbols would represent a fused disconnect?

- a. A
- b. B
- c. C
- d. D**
- e. All of the listed options

7. Which one of these symbols would not have any overcurrent protection?

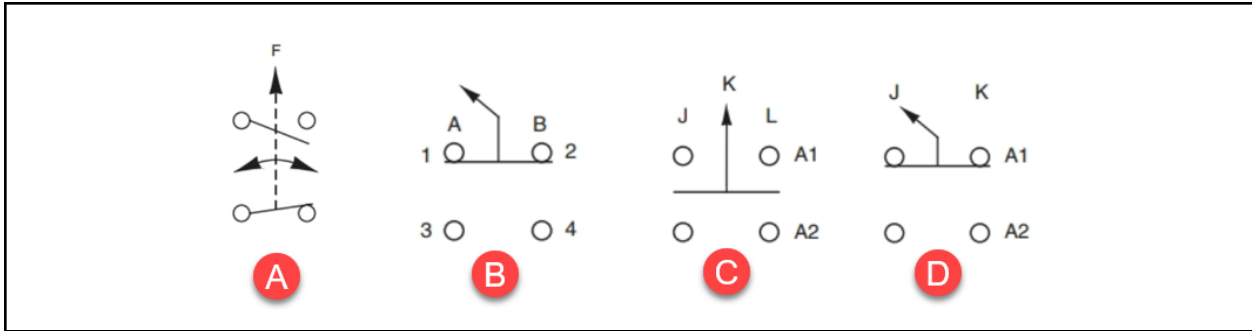
- a. A
- b. B
- c. C**
- d. D

8. Which one of these symbols would represent a standard 3-phase circuit breaker?

- a. A
- b. B**
- c. C
- d. D

9. Which one of these symbols would represent a disconnect that is used within close proximity to a 3-phase motor, with the purpose of a safety disconnect?

- a. A
- b. B
- c. C**
- d. D

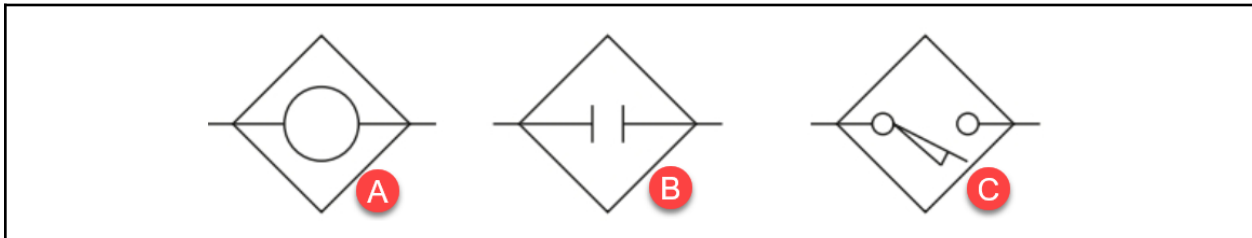


10. Which one of these symbols would be for a 4 position selector switch?

- a. A
- b. B
- c. C
- d. D
- e. **None of the listed options**

11. What device is represented by the symbol marked with a “C”?

- a. Universal selector switch
- b. Two position selector switch
- c. **Three position selector switch**
- d. Four position selector switch



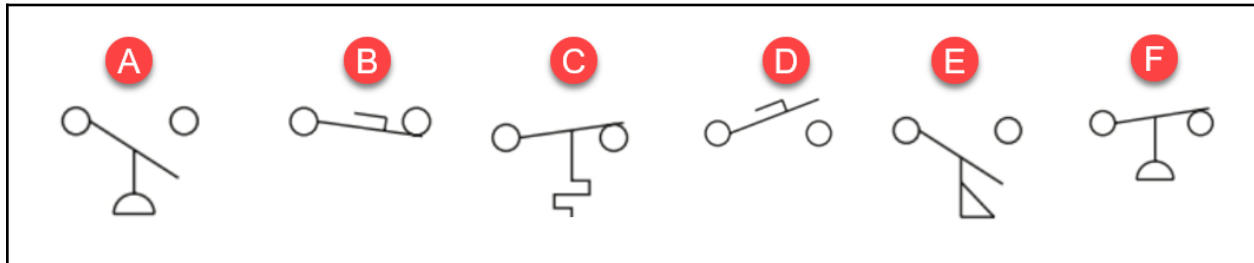
12. What does the diamond around a symbol represent about the device?

- a. A safety device
- b. **The device is solid state**
- c. A sealed/waterproof device
- d. ANSI approved device

13. Which device would typically represent a photo-electric switch?

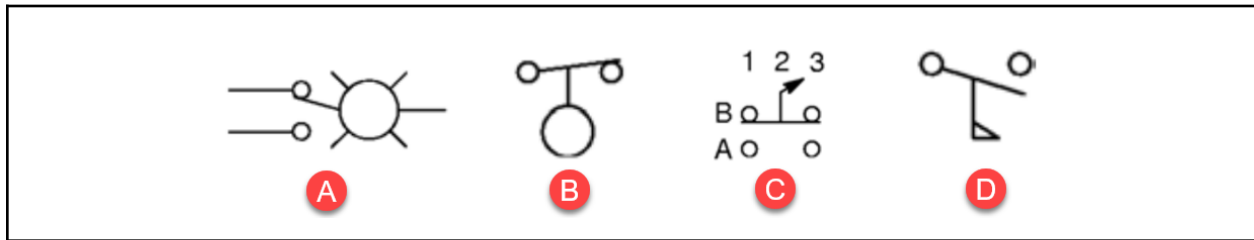
- a. A
- b. **B**
- c. C
- d. None of the listed options

14. Which device would typically represent a proximity switch?
- A
 - B
 - C
 - None of the listed options



15. The NEMA electrical symbol marked with a “B” would be a:
- Normally open footswitch
 - Normally closed footswitch**
 - Normally closed knife switch
 - Normally open, held closed foot switch
16. Which one of these NEMA electrical symbols represents a normally closed pressure switch?
- A
 - B
 - C
 - D
 - E
 - F**
17. Which one of these NEMA electrical symbols represents a normally closed footswitch?
- A
 - B**
 - C
 - D
 - E
 - F
18. The NEMA electrical symbol marked with a “C” would be a:
- Normally liquid level switch
 - Normally closed vane switch
 - Normally closed temperature switch**

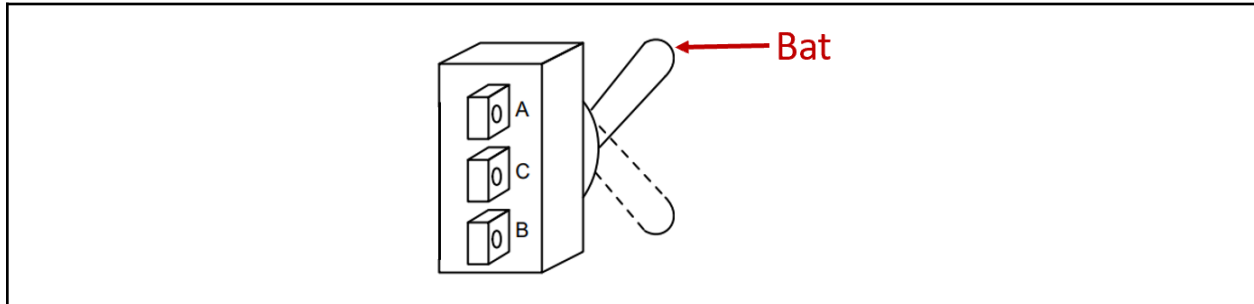
- d. Normally closed pull string switch



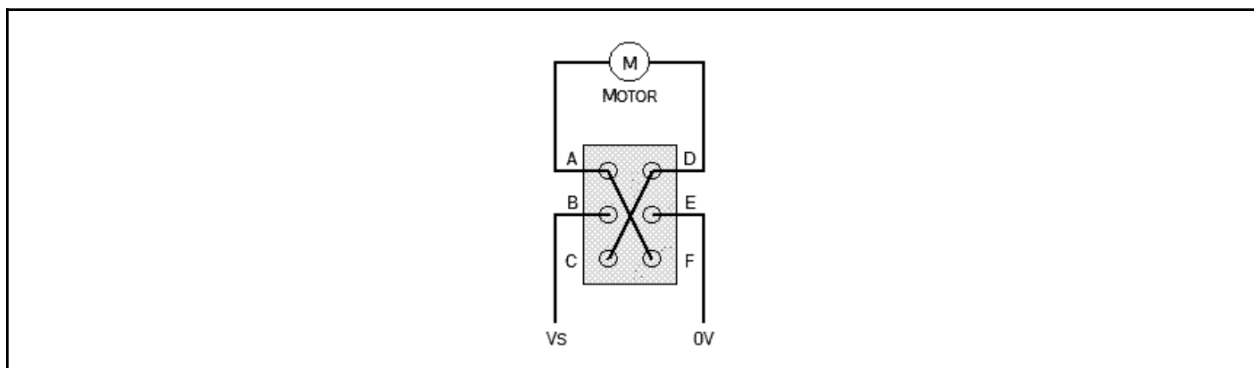
19. The NEMA symbol marked with an “A” would represent what type of device?
- Push to test pilot light**
 - SPDT toggle switch with an indicator light
 - Toggle light switch
 - This is not a standard NEMA symbol
20. Which switch position on the device marked with a “C” closes the “A” contact?
- 1**
 - 2
 - 3
 - The “A” contact cannot be closed
21. If the device marked with a “C” is put into position “2”, what contact(s) will be closed?
- Contact A
 - Contact B
 - Neither contact will be closed**
 - Both contacts will be closed
22. The NEMA symbol marked with a “D” represents which type of device?
- Normally closed liquid level switch
 - Normally closed flow switch
 - Normally open flow switch**
 - Normally open pressure switch
 - Normally closed pressure switch

Question Pool 2:Switches:

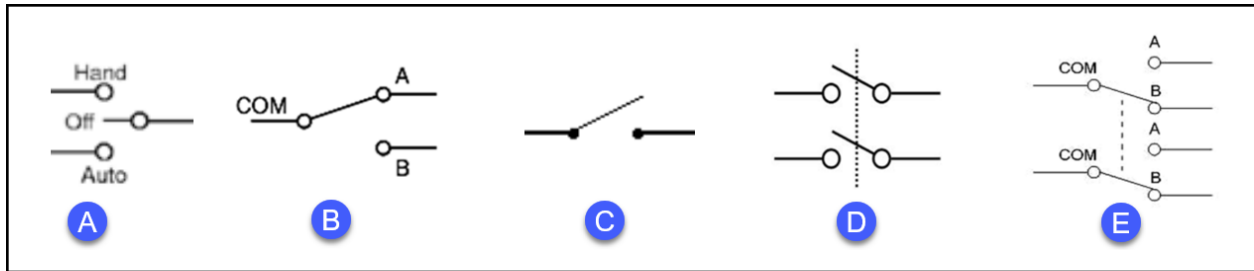
1. A 3-way switch functions the same as a:
 - a. SPST switch
 - b. SPDT switch**
 - c. DPST switch
 - d. DPDT switch
2. T F A four way switch means that a light/load can be controlled at 4 different locations.



3. What two terminals will have continuity on the SPDT switch if the Bat is in the up position?
 - a. A & B
 - b. B & C**
 - c. A & C
4. What two terminals will have continuity on the SPDT switch if the Bat is in the down position?
 - a. A & B
 - b. B & C
 - c. A & C**



5. What type of switch is used in this graphic to change the direction of a DC motor
 - a. SPDT
 - b. DPDT**
 - c. DPST
 - d. SPST



6. Which one of these switches would be termed a 3-way switch when installing a switch for a lighting circuit in a residential application?

- a. A
- b. B**
- c. C
- d. D
- e. E

7. Which one of these switches could be used as a 4-way switch in a lighting circuit in a residential application?

- a. A
- b. B
- c. D
- d. E**
- e. None of the listed options

8. Which one of these switches would be termed a DPST type of switch?

- a. A
- b. B
- c. C
- d. D**
- e. E

9. Which one of these switches would be termed a SPDT type of switch?

- a. A
- b. B**
- c. C
- d. D
- e. E

10. Which of the switches could be used to turn on a 12 Vdc load, and a 24 Vdc load with 1 flip of a switch? (choose all that apply)

- a. A
- b. B
- c. C
- d. D**
- e. E

11. The dotted line on the switch symbols marked with D & E indicates:

- a. Both contacts have the same current rating
- b. Both contacts are switched simultaneously with the switch operator (bat on front of switch)**
- c. The contacts are independent
- d. The switches are mounted in close proximity

12. Which one of these switches would be termed a 3 position selector switch?

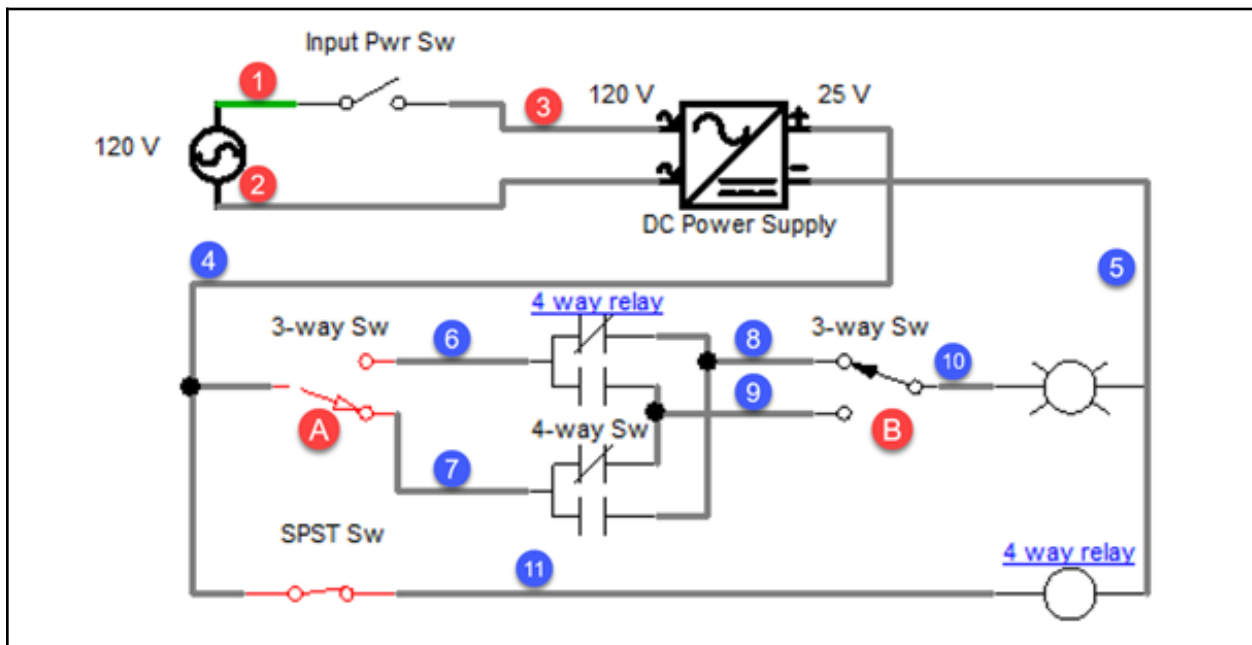
- a. A**
- b. B
- c. C
- d. D
- e. E

13. Which of the switches could be used to toggle two 24 Vdc pilot lights? In one switch position PL_1 on (and PL_2 is off), in the other position PL_2 is on (and PL_1 is off). (choose all that apply)

- a. A**
- b. B**
- c. C
- d. D
- e. E**

Question Pool 3: Questions on the circuits from Lab 2.1 & 2.2

Lab 2.1 circuit 2



1. How many locations can the pilot be toggled from in this circuit?
 - a. 2
 - b. 3**
 - c. 4
 - d. 5

2. What could be wrong if the SPST Sw is closed, but the 4 way relay does not energize?
 - a. No 25 Vdc power coming out of the DC power supply**
 - b. 3-way switch "B" is faulty
 - c. 3-way switch "A" is faulty
 - d. All of the listed options

3. What could be wrong if the SPST Sw is closed, but the 4 way relay does not energize?

- a. No 25 Vdc power coming out of the DC power supply
- b. Severed wire between the SPST Sw and the 4 way relay coil
- c. The 4 way relay coil is open
- d. All of the listed options**

4. What could be wrong if there is not 25 Vdc coming from the DC power supply? (assume the 120V incoming power is present)

- a. Input Pwr Sw is faulty
- b. Faulty DC power supply
- c. Severed wire in the input side of the DC power supply
- d. All of the listed options**

5. What could be wrong if there is not 25 Vdc coming from the DC power supply? (assume the 120V incoming power is present)

- a. Input Pwr Sw is faulty**
- b. 3-way switch "A" is faulty
- c. Severed wire 5 between the pilot light and the 4 way relay coil
- d. All of the listed options

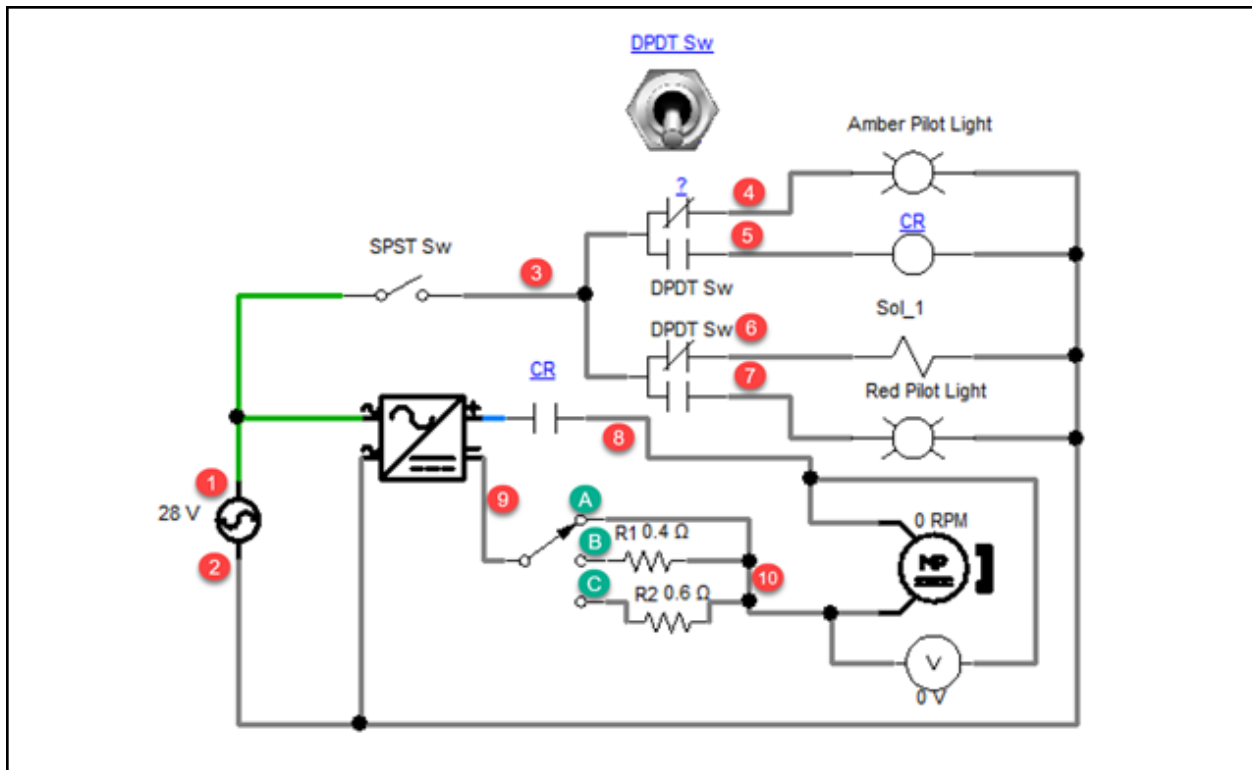
6. If 25 V was present at the output terminals of the DC power supply, what would be the voltage measured between wires 7 & 5?

- a. 0 V
- b. 25 Vdc**
- c. 25 Vac
- d. 120 Vac

7. If 25 V was present at the output terminals of the DC power supply, what would be the voltage measured between wires 6 & 5?

- a. 0 V**
- b. 25 Vdc
- c. 25 Vac
- d. 120 Vac

Lab 2.1 circuit 3



8. T F The motor will run if the DPDT switch is in the off position (assuming the SPST Sw is on).

9. What output is on if the SPST Sw is closed, and the DPDT switch is in the up position?

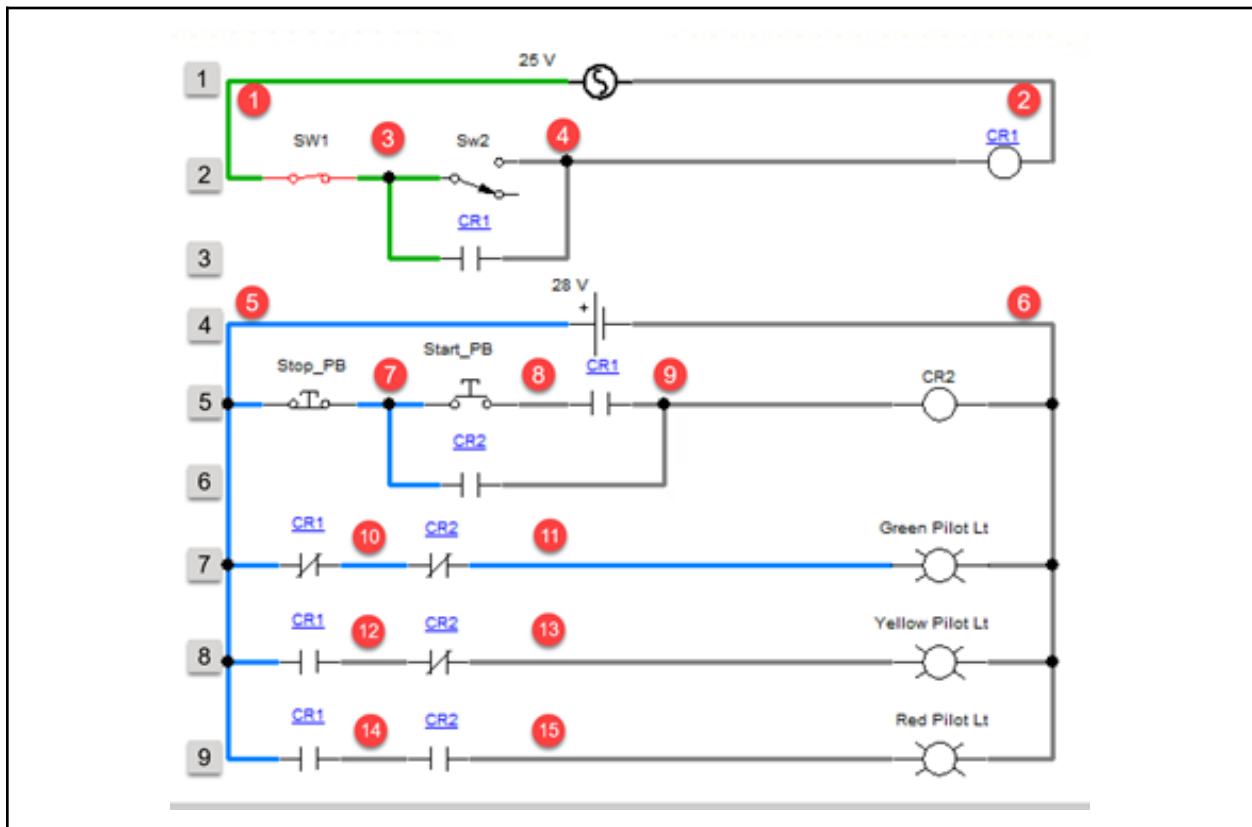
- a. Amber Pilot Light
- b. CR
- c. Sol_1
- d. All of the listed options

10. What could be wrong if the Selector switch is in the “A” position, the voltage from 8-10 is 24 Vdc, and the motor will not turn?

- a. **Motor is bad**
 - b. CR not on
 - c. Severed wire between the DC power supply and the Selector switch
 - d. All of the listed options
11. What position of the selector switch will make the motor run at the slowest speed?
- a. A
 - b. B
 - c. **C**
 - d. The motor will run the same speed in all 3 positions
12. T **F** CR can be energized even if the SPST Sw is open.
13. How is the motor affected when a resistor in series with the motor?
- a. Speed increases
 - b. **Speed decreases**
 - c. No effect on the motor
 - d. The motor overloads
14. What switch position will run the motor at the maximum speed?
- a. **A**
 - b. B
 - c. C
 - d. The motor will run the same speed in a 3 positions
15. The device used to switch between the resistors is termed a:
- a. Single Pole, Single Throw
 - b. **3 position selector switch**
 - c. 2 position selector switch
 - d. None of the listed options
16. Which output is on if the SPST Sw is closed, and the DPDT switch lever is in the down position?
- a. **Sol_1**
 - b. CR
 - c. Red Pilot Light
 - d. Sol_1 & CR

Question Pool 4: Questions on the circuits from Lab 2.3 & 2.4

Lab 2.3 Circuit 1



1. Which pilot light in this circuit would be on when CR1 and CR2 are both on?

- a. Green Pilot Light
- b. Yellow Pilot Light
- c. Red Pilot Light**
- d. None of the listed options

2. Which pilot light in this circuit would be on when CR1 is on, and CR2 is off?

- a. Green Pilot Light
 - b. Yellow Pilot Light**
 - c. Red Pilot Light
 - d. None of the listed options
3. Which pilot light in this circuit would be on when CR1 is off, and CR2 is on?
- a. Green Pilot Light
 - b. Yellow Pilot Light
 - c. Red Pilot Light
 - d. None of the listed options**
4. What would be the contact cross reference for CR2?
- a. 6, 7, 8, 9**
 - b. 6, 7, 8, 9
 - c. 6, 7, 8, 9
 - d. 5, 6, 7, 8, 9
5. What would be the contact cross reference for CR1?
- a. 3, 5, 7, 8, 9**
 - b. 3, 5, 7, 8, 9
 - c. 3, 5, 7, 8, 9
 - d. 2, 3, 5, 7, 8, 9
6. If CR2 is on, and no pushbuttons are actuated, what would the voltage be between wires 9 & 6?
- a. 0 V
 - b. 28 Vdc**
 - c. 25 Vac
 - d. 25 Vdc
7. If CR2 is on, and no pushbuttons are actuated, what would the voltage be between wires 9 & 6?
- a. 0 V
 - b. 28 Vdc**
 - c. 25 Vac
 - d. 25 Vdc
8. If CR1 is on, and no pushbuttons or switches are actuated, what would the voltage be between wires 10 & 6?

- a. **0 V**
- b. 28 Vdc
- c. 25 Vac
- d. 25 Vdc

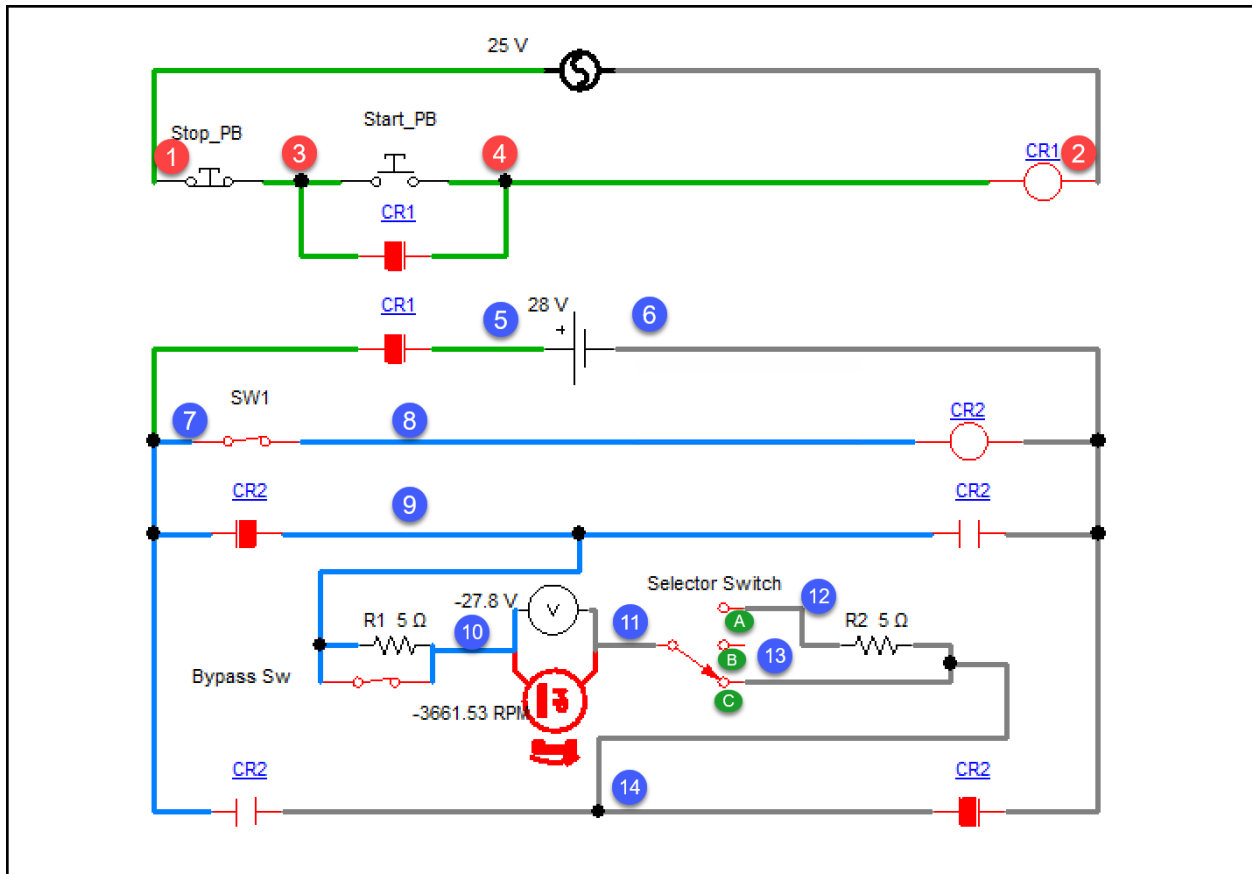
9. What could be wrong if the yellow pilot light is not coming on, yet there is 25 Vdc between wires 13 and 6?

- a. Faulty yellow pilot light
- b. Severed wire between N.C. CR2 on line 8 and the Yellow Pilot Light
- c. Severed wire between right of Yellow Pilot Light and the #6 wire
- d. **All of the listed options**

10. What could be wrong if the yellow pilot light is not coming on, yet there is 25 Vdc between wires 13 and 6?

- a. Faulty CR2 relay
- b. **Severed wire between N.C. CR2 on line 8 and the Yellow Pilot Light**
- c. Faulty CR1 relay
- d. All of the listed options

Lab 2.3 Circuit 2



11. How will the motor speed be affected if the motor is running, and the Bypass Sw is changed from an open to a closed state?

- The speed will decrease
- The speed will increase**
- There will be no effect on the speed
- The motor will stop if the bypass switch is open

12. How will the motor speed be affected if the motor is running, and the Bypass Sw is changed from a closed to an open state?

- The speed will decrease**
- The speed will increase
- There will be no effect on the speed
- The motor will stop if the bypass switch is open

13. If CR2 is energized the motor will:

- Run faster
- Run in the opposite direction**
- De-energize, or stop
- CR2 has no effect on the motor

14. How would it affect the motor if CR1 is shut off?
- Motor will speed up
 - Motor will be disabled**
 - Motor will run at 50% of maximum speed
 - CR1 has no effect on the motor
15. How will the motor be affected if the voltage on the motor goes up?
- The motor speed will increase**
 - The motor speed will decrease
 - Voltage does not affect the speed of the motor
16. If CR1 is energized, what voltage should be measured between wires 7 & 6?
- 0 volts
 - 25 Vac**
 - 28 Vdc
 - 14 Vdc
17. If CR1 is not energized, what voltage should be measured between wires 7 & 6?
- 0 volts**
 - 25 Vac
 - 28 Vdc
 - 14 Vdc
18. What could be wrong if CR1 will not energize when the Start_PB is pressed, yet the voltage between wires 4 & 2 is 25 Vac?
- CR1 coil is faulty**
 - Start_PB is faulty
 - CR1 hold-in contact is faulty
 - All of the listed options
19. How would it affect the motor if the motor was running, and the Selector Switch was moved from the “C” position to the “B” position?

- a. Motor will speed up
- b. Motor will slow down
- c. Motor will be disabled**
- d. Motor will run at 50% of maximum speed

20. How would it affect the motor if the motor was running, and the Selector Switch was moved from the “C” position to the “A” position?

- a. Motor will speed up
- b. Motor will slow down**
- c. Motor will be disabled
- d. Motor will run at 50% of maximum speed

21. How would it affect the motor if the motor was running, and the Selector Switch was moved from the “A” position to the “C” position?

- a. Motor will speed up**
- b. Motor will slow down
- c. Motor will be disabled
- d. Motor will run at 50% of maximum speed