Control systems

Course code: xxxx

Sheet 01 — intro to control

1. Imagine you are in a cabin in front of a small fire on a cold winter evening. You feel uncomfortably cold, so you throw another log into the fire. In this scenario, the **process variable** is temperature. Is this true or false?
   (a) True
   (b) False
2. If the level of a liquid in a tank must be maintained within $5\ ft\ of\ 50\ ft$, what is the liquid's **set point**?
   (a) 45 ft
   (b) 55 ft
   (c) 5 ft
   (d) 50 ft
3. A **load disturbance** is an undesired change in one of the factors that can affect the set point. Is this statement true or false?
   (a) True
   (b) False
4. Under what circumstances does an open control loop exist? **Select all options that apply**.
   (a) Process variable is measured and compared to a set point
   (b) Process variable is measured
   (c) Action is taken without regard to process variable conditions
   (d) Action is taken with regard to process variable conditions
5. Which one of these in not considered as an example of **primary element/sensors** in process control?
   Select all options that apply.
   (a) Resistance Temperature Detectors
   (b) Thermocouples
   (c) Control Valve
   (d) Pilot tubes
6. **Primary elements** will not make direct contact with the process fluid. Is this statement true or false?
   (a) True
   (b) False
7. A **transmitter** is a device that converts a reading from a transducer into a standard signal and transmits that signal to a monitor or controller. Is this statement true or false?
   (a) True
   (b) False
8. Which of the following are examples of a **digital signal**? Select all options that apply
   (a) Profibus
   (b) 4 - 20 mA
   (c) 3 - 15 psig
   (d) 1 - 5 v
9. Which of the following have the ability to receive input, to perform a mathematical function with the input, and produce an output signal?
   (a) Actuators
   (b) Transmitters
   (c) Transducers
   (d) Controllers
10. Which of the following variables are not commonly measured or monitored in process control applications?
    (a) Pressure
    (b) Viscosity
    (c) Temperature
    (d) Flow rate
11. 4–20 mA is the most common standard analog signal used in the process control industry today. Is this statement true or false?
    (a) True
    (b) False
12. _____ is a continuing error due to the inability of a control system to keep the measured variable at set point.
    (a) Load disturbance
    (b) Offset
    (c) Pressure
    (d) Temperature
13. Match each term to its correct definition.

(1) Load disturbance
(2) Control algorithm

(3) Manual control
(4) Manipulated variable
(5) Set point

(A) The factor that is changed to keep a measured variable at set point.
(B) An undesired change in a factor that can affect the process variable.
(C) A value or range of values for a process variable that must be maintained to keep the process running properly.
(D) A control operation that directly involves human action.
(E) A mathematical expression of a control function

14. Match each term to its correct description.

(1) Closed-loop, automatic control
(2) Closed-loop, manual control
(3) Open-loop, automatic control

(A) An operator turns off the heater coil when the temperature transmitter outputs a certain reading.
(B) A controller turns off the heater coil at set intervals, regardless of the process temperature.
(C) A temperature sensor measures process temperature, sends the result to a controller to compare to the set point, and the controller turns off the heater coil.

15. Match the signal type in Column A with its example/application in Column B.

(1) Analog signal
(2) Pneumatic signal
(3) Digital signal

(A) 3 –15 psig
(B) Fieldbus, Profibus and Modbus
(C) 4-20 mA and 1 – 5 V

16. Identify the **input** and **output** for the pivoted, adjustable mirror of Figure below