

## I&C Technician Sample Question & Answer

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1. The most linear temperature sensing element listed here is a/an:

- (A) RTD
- (B) Thermistor
- (C) Bellows
- (D) Diode
- (E) Thermocouple

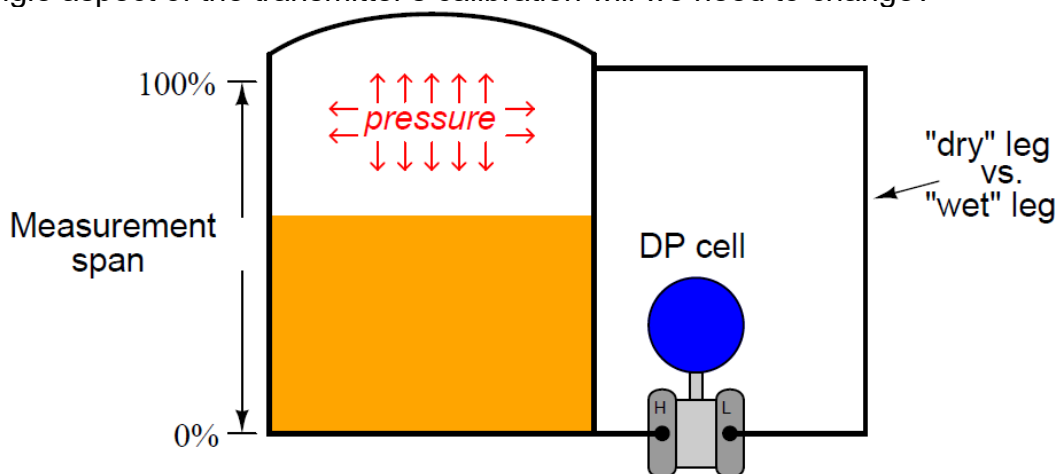
Ans: A

2. A type K thermocouple is made from which of the following metals?

- a. Chromel and Alumel
- b. Platinum and Platinum/Rhodium alloy
- c. Aluminum and Tungsten
- d. Copper and Constantan

Ans. A

3. If we alter this level measurement system to have a wet leg instead of a dry leg , what single aspect of the transmitter's calibration will we need to change?



- (A) We will need to change the transmitter's URV
- (B) We will need to change the transmitter's span
- (C) We will need to change the transmitter's zero
- (D) We will need to change the transmitter's LRV
- (E) We will need to change the transmitter's linearity

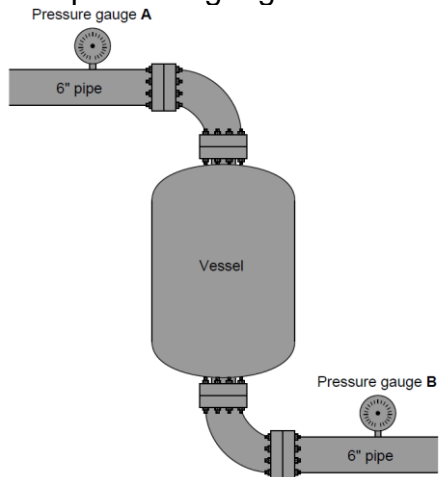
Ans: C

4. Flow-straightening vanes are used upstream of orifice plate flow elements when:

- (A) Accuracy is not a concern
- (B) The process fluid is a gas
- (C) The flow profile is laminar
- (D) Insufficient straight-pipe length exists
- (E) The process fluid is a liquid

Ans: D

5. Identify the condition that could cause pressure gauge A to register a greater pressure than pressure gauge B in this liquid process:



- (A) A high rate of flow from left to right (top to bottom through the vessel)
- (B) An extremely dense liquid
- (C) Liquid boiling inside the vessel
- (D) A high rate of flow from right to left (bottom to top through the vessel)
- (E) Pressure gauge B calibrated for absolute pressure units instead of gauge units

Ans: A

6. Suppose a storage vessel holds a liquid of unpredictable density. Identify which level measurement technology will not maintain accurate measurement of liquid height in the vessel as the liquid density changes:

- (A) Sightglass
- (B) Guided-wave radar
- (C) Float and tape
- (D) Differential pressure transmitter
- (E) Ultrasonic

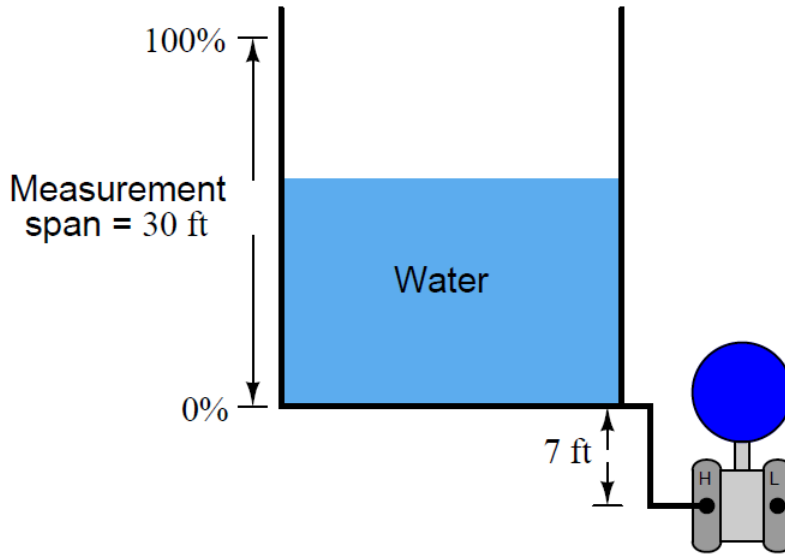
Ans: D

7. The purpose of performing an “As Found” calibration on a pressure transmitter is to:

- (A) Eliminate hysteresis and deadband from the instrument
- (B) Spend more time calibrating the instrument
- (C) Establish a baseline for comparison, to detect calibration drift
- (D) “Exercise” the instrument to keep it in better condition over time
- (E) Diagnose control problems in the loop

Ans: C

8. Calculate the LRV and URV for this DP-based liquid level measurement system:



- (A) LRV = 444 "H2 O ; URV = 0 "H2 O
  - (B) LRV = 0 "H2 O ; URV = 360 "H2 O
  - (C) LRV = 0 "H2 O ; URV = 444 "H2 O
  - (D) LRV = 84 "H2 O ; URV = 444 "H2 O
  - (E) LRV = 7 "H2 O ; URV = 37 "H2 O
- Ans: D

9. Which of the following level-measurement technologies cannot be adapted to measure solid (powder) level in a vessel?

- (A) Float and tape
  - (B) Ultrasonic
  - (C) Load cell
  - (D) Displacer
  - (E) Radar
- Ans: D

10. A guided-wave radar transmitter is able to measure liquid interface levels based on differences of \_\_\_\_\_ between the two liquids.

- (A) Ionization potential
  - (B) Density
  - (C) Speed of light
  - (D) Temperature
  - (E) Dielectric constant
- Ans: E

11. Calculate the hydrostatic pressure at the bottom of a vessel holding 12 vertical feet of liquid with a density of 50 lb/ft<sup>3</sup> .

- (A) 18.867 PSI
- (B) 14.98 PSI

- (C) 5.202 PSI
- (D) 4.167 PSI
- (E) 6.495 PSI

Ans: D

12. The negative lead of a thermocouple in North America is always colored:

- (A) Yellow
- (B) Red
- (C) White
- (D) Black
- (E) Blue

Ans: B

13. Reference junction compensation is necessary in thermocouple-based temperature instruments because:

- (A) Thermocouples are inherently nonlinear
- (B) The reference junction generates a temperature-dependent voltage
- (C) The junction's electrical resistance varies with temperature
- (D) Electrical noise may interfere with the measurement otherwise
- (E) Copper extension wire has a tendency to corrode

Ans: B

14. Thermocouple extension wire may be readily distinguished from regular thermocouple-grade wire by:

- (A) Different metal types
- (B) Special markings on the wire's insulation
- (C) Thickness
- (D) Flexibility (stranded instead of solid)
- (E) Outer sheath color

Ans: E

15. As an incompressible fluid moves through a restriction,

- (A) Velocity decreases and pressure remains the same
- (B) Velocity decreases and pressure increases
- (C) Velocity increases and pressure increases
- (D) Velocity increases and pressure remains the same
- (E) Velocity increases and pressure decreases

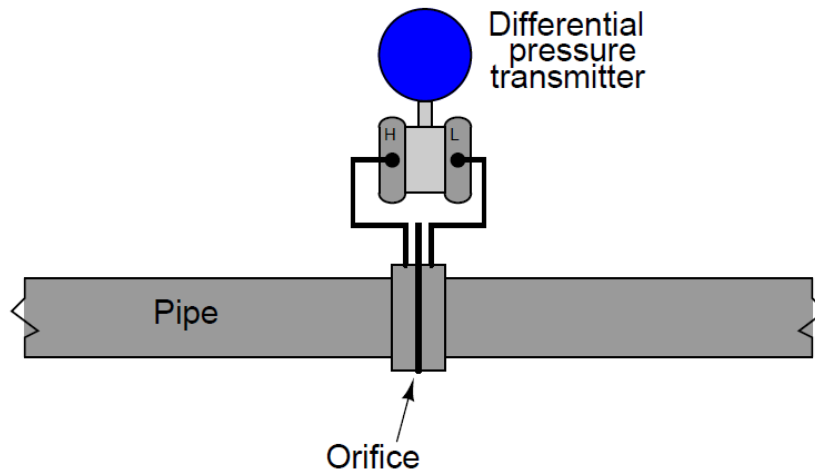
Ans: E

16. For accurate operation, orifice plate flowmeters require:

- (A) Swirls and eddies in the flow stream
- (B) Transitional flow
- (C) Plug flow
- (D) Laminar flow
- (E) Fully-developed turbulent flow

Ans: E

17. Based on the relative positions of transmitter and orifice plate, this flow-measuring installation is suitable for:



- (A) Water or oil flow
- (B) Gas flow
- (C) Steam flow
- (D) Laminar flow
- (E) Slurry flow

Ans: B

18. A DP transmitter calibrated for a range of 0 to 100 "H<sub>2</sub>O measures liquid flow through an orifice plate from 0 to 1200 GPH. Calculate the new calibration range for the transmitter if we desire to decrease the flow measurement range to 0 to 700 GPH, using the same orifice plate.

- (A) 0 to 34.03 "H<sub>2</sub>O
- (B) 0 to 76.38 "H<sub>2</sub>O
- (C) 0 to 171.4 "H<sub>2</sub>O
- (D) 0 to 293.9 "H<sub>2</sub>O
- (E) 0 to 58.33 "H<sub>2</sub>O

Ans: A

19. Identify which of the following flowmeters inherently measures mass flow rate:

- (A) Magnetic
- (B) Flow nozzle
- (C) Thermal
- (D) Vortex
- (E) Venturi tube

Ans: C

20. The pH of a liquid solution is a measure of:

- (A) Dissolved salt content
- (B) Hydroxyl ion molarity
- (C) Hydrogen ion activity
- (D) Electrical conductivity

(E) Sodium ion molarity

Ans: C

21. Flue gas oxygen measurement ("O2 trim") is important in combustion control systems for the purpose of:

- (A) Reducing sulphur emissions
- (B) Safer shut-downs
- (C) Faster start-ups
- (D) Reducing NOX emissions
- (E) Minimizing burner noise

Ans: D

22. A chromatograph separates and distinguishes different molecule types in a fluid stream by:

- (A) Emitted light spectra
- (B) Atomic mass (weighing)
- (C) Electric charge
- (D) Adsorption time-delay
- (E) Reverse osmosis

Ans: D

23. ORP measurement is often used in processes where:

- (A) The addition of an oxidant must be controlled
- (B) The octane value of a liquid fuel is important
- (C) Conductivity of the liquid is negligible
- (D) Pigments are added to a solution to control color
- (E) Precise temperature control is critical

Ans: A

Ans: C

24. An analog signal is the meaning of which of the following?

- a. either a 1 or a 0.
- b. either on or off.
- c. varying voltage.
- d. any of the above.

Ans: C

25. Computers rely on \_\_\_\_\_ for their input signals:

- a. solenoids.
- b. sensors.
- c. actuators.
- d. all of the above.

Ans: B

Sensors translate a physical condition into an electrical signal input.

26. What does it mean when a d/p cell used to measure liquid level has a suppressed zero?

- a. transmitter uses filter circuits to suppress noise to a zero level
- b. transmitter is located above the 0% liquid level mark
- c. liquid is less dense than water
- d. transmitter is located below the 0% liquid level mark

Ans. D

27. What must be determined prior to selecting a hydronic circulator from which of the following?

- a. Height of building and flow rate.
- b. System resistance and flow rate.
- c. System resistance and pipe size.
- d. Height of building and pipe size.

Ans. B

28. Which of the following is the minimum wall thickness of pipe required when cut grooving steel pipe for a hydraulic system?

- a. Schedule 120.
- b. Schedule 80.
- c. Schedule 20.
- d. Schedule 40.

Ans. B

29. Which of the following answers given below does fluid power actuators convert fluid?

- a. Motion
- b. Pressure
- c. Work speed
- d. Extreme pressure

Ans. A

30. A buffer solution is used with pH probes for the purpose of which of the following?

- a. Cleaning
- b. Electrode inspection
- c. Calibration
- d. Purging embedded sodium ions

Ans. C

31. A flue gas oxygen measurement (O<sub>2</sub> trim) is important in combustion control systems for the purpose of which of the following?

- a. Faster start-ups
- b. Safer shut-downs
- c. Reducing sulphur emissions
- d. Reducing NO<sub>x</sub> emissions

Ans. D

32. Which of the following means the purpose of feed forward control?

- a. reduce the effect of process variable noise on stability
- b. save energy
- c. reduce the effect of load variation on the process variable
- d. eliminate the need for feedback control in a process

Ans. C

33. Which of the following is a retentive function in a PLC programming?

- a. Defaults to the “off” state
- b. Comes last in the program
- c. Defaults to the “on” state
- d. Is not reset after a power cycle

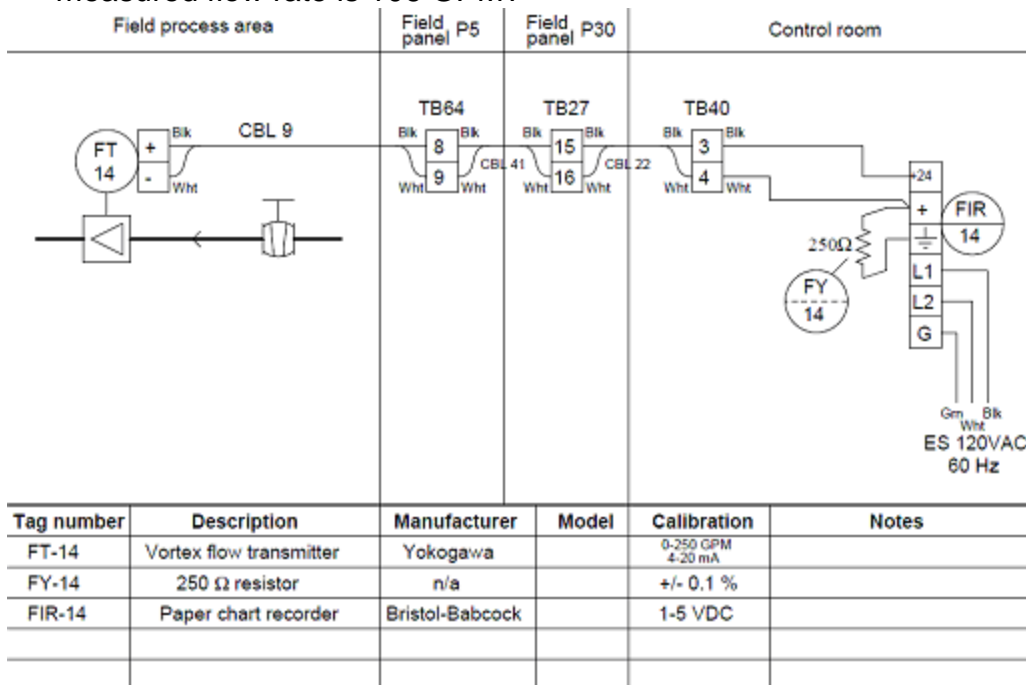
Ans. D

34. Where noise is present, but where no offset can be tolerated, what type of control is used in an application?

- a. PID
- b. PD
- c. PI
- d. P only

Ans. C

35. Assume a loop power supply voltage of exactly 24.00 volts, and negligible wire resistance. Calculate the voltage between terminals 15 and 16 of TB27 when the measured flow rate is 106 GPM?



- a. 28.60 volts
- b. 23.48 volts
- c. 21.30 volts



d. 24.50 volts

Ans. C

36. Which of the following is a deviation from set point due to load disturbance?

a. Rate of change

b. Offset

c. Error

Ans. C

37. What is the correct type of ring type joint RTJ gasket to be installed on a hydraulic line?

a. Spiral wound.

b. Type D.

c. Crush Ring.

d. Type A.

Ans. B

38. Which of the following is a typical use for an integer variable in a digital control system?

a. Trigonometric math operations

b. Representing power supply voltage

c. Representing single switch status

d. Counting discrete events

Ans. D

39. Is this statement true or false? The standard analog signal 4–20 mA is the most common and used in the process control industry today?

True

False

Answer: True

40. While watching the pressure gauge as the pump is running, which procedure is used to get the best pumping rate from a two pipe convertible deep well jet system?

a. Throttle the pump discharge control valve.

b. Adjust the range nut with the pump running.

c. Adjust the differential nut with the pump running.

d. Open the pump discharge control valve fully.

Ans. A

41. Digital control systems are generally superior to analog control systems, but they are negative with regards to?

a. Flexibility

b. User-friendliness

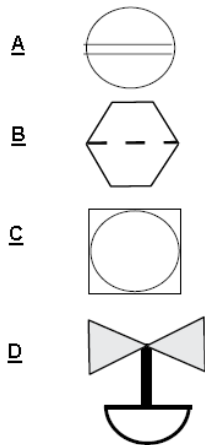
- c. Diagnostics
  - d. Speed
- Ans. D

42. A triple modular redundant (TMR) digital control system would be typically used for what purpose?

- a. control a potentially dangerous process
- b. save money (compared to other control systems)
- c. increase response speed for fast processes
- d. save energy (compared to other control systems)

Ans. A

43. Which of the following symbols is a pneumatic valve?



Ans. D

44. Which of the following does PPE stands for?

- a. Prepared protective equipment
- b. Personal proactive equipment
- c. Personal protective equipment
- d. Pre-arranged protective equipment

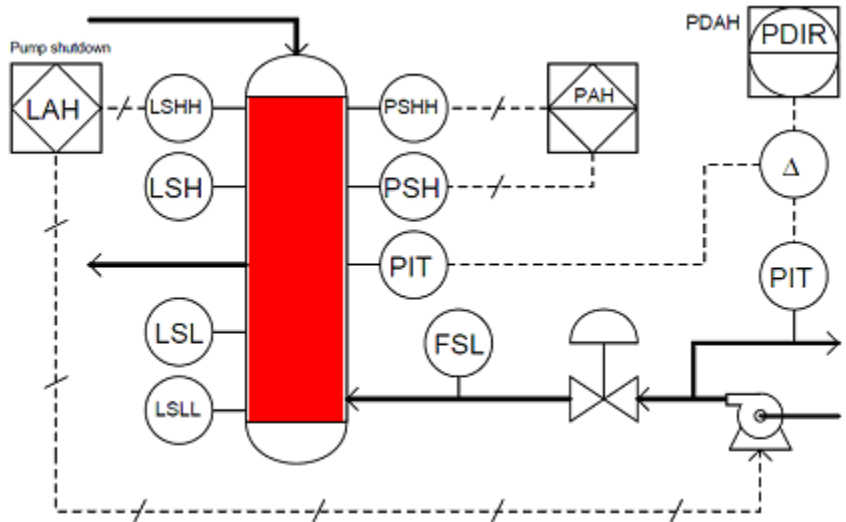
Ans. C

45. Which of the following will increasing spring tension?

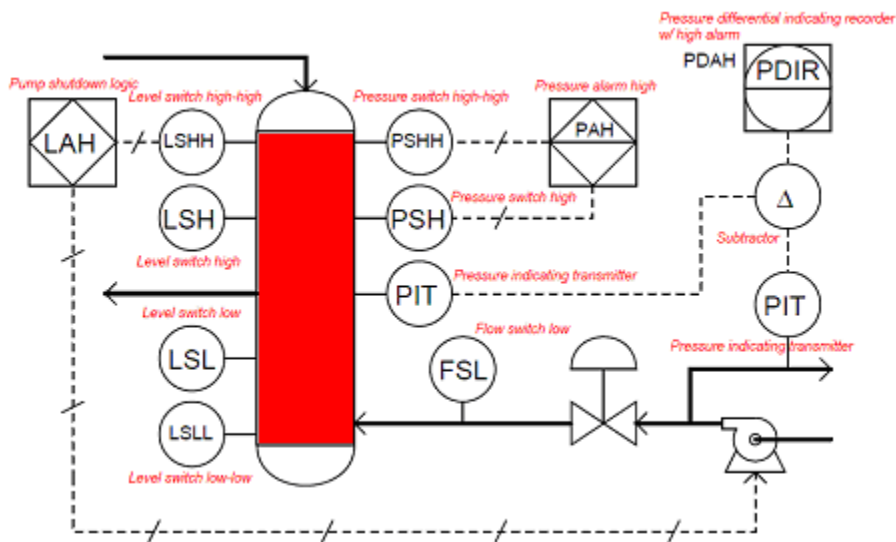
- a. cause the valve to open more quickly.
- b. change the stroke of the valve by decreasing it.
- c. increase the length of valve travel.
- d. cause the valve to start opening at an increased diaphragm pressure.

Ans. D

46. Identify the meanings of the following instruments in this P&ID?



**Answer:**



47. Which of the following describes an electronic tachometer?

- a. receives voltage pulses from the injectors.
- b. measures actual vehicle speed.
- c. gear driven by the transmission.
- d. receives voltage pulses from an ignition signal.

Ans. D - An ignition signal from the negative side of the ignition coil.

48. Which of the following describes a final control element?

- a. pneumatic instrument
- b. pipe or vessel
- c. indicator

d. valve

Ans. D

49. In an instrument requiring calibration, which of the following adjustments is usually adjusted first?

- a. Hysteresis
- b. Span
- c. Deadband
- d. Zero

Ans. D

50. Which of the following devices activates the motor in an instrument air compressor?

- a. Level switch.
- b. Vacuum switch.
- c. Pressure switch.
- d. Temperature switch.

Ans. C

51. Calculate the fluid pressure working against the piston if a force of 3400 pounds is applied to a circular piston 2 inches in diameter?

- a. 549.5 PSI
- b. 1082.3 PSI
- c. 750 PSI
- d. 1600 PSI

Ans. B

52. When taking a differential pressure transmitter out of service, identify the proper sequence of valve actions for a three-valve manifold and bleed?

- a. Open equalizing valve, close both block valves (simultaneously), open bleed
- b. Open bleed, close one block valve, open equalizing valve, close other block valve
- c. Open equalizing valve, open bleed, close both block valves (simultaneously)
- d. Close one block valve, open equalizing valve, close other block valve, open bleed

Ans. D

53. The warning lamp of a charging-system is activated by which of the following?

- a. difference in voltage.
- b. pressure switch.
- c. variable resistance sending unit.
- d. temperature switch.

Ans. A - The regulator grounds the lamp circuit.

54. Which of the following is the maximum pressure relief valve located at?

- a. Close to the pump
- b. Doesn't matter, as long as it is in the system
- c. Anywhere on the return line
- d. Mounted on the tank

Ans. A

55. Current measurements are more dangerous to make with a multi-meter than voltage measurements due to which of the following?

- a. resulting magnetic fields may be very strong
- b. Most multi-meters are un-fused
- c. must use both hands to take the measurement
- d. circuit must be broken (opened)

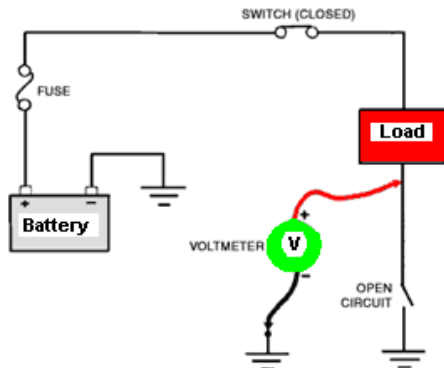
Ans. D

56. What type of error is indicated while calibrating a variable speed drive, 10% input equals 15% speed, 50% input equals 55% speed and 90% input equals 95% speed?

- a. Zero.
- b. Alignment.
- c. Angularity.
- d. Span.

Ans. A

57. The voltmeter in the circuit below should read which of the following given?



- a. 6.0 volts.
- b. 14.4 volts.
- c. source voltage.
- d. 12.0 volts.

Ans. C

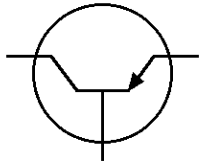
With an open switch, source voltage runs all the way to the open.

58. Which of the following is a continuing error due to the inability of a control system to keep the measured variable at set point?

- a. Pressure
- b. Offset
- c. Load disturbance

Ans. B

59. The arrow in the transistor indicates which of the following given below?



- a. which side the electrical load is placed in the circuit.
- b. NPN type of transistor.
- c. direction of positive current flow as it flows to ground.
- d. collector circuit.

Ans. C

60. When is it safe to remove the old packing from a valve that is under pressure?

- a. When the valve is completely closed.
- b. When the valve is back seated.
- c. When the valve is completely open.
- d. Never

Ans. D

61. What is the most likely cause if a fuse blows again after it has been replaced?

- a. Open circuit in component.
- b. The ground point has become disconnected.
- c. Current or amps through circuit too high.
- d. Resistance in the circuit is too high.

Ans. C

A drop in circuit resistance will cause current flow to increase.

62. Which of the following listed is a level-measurement technologies that cannot be adapted to measure solid (powder) level in a vessel?

- a. Load cell
- b. Ultrasonic
- c. Float and tape
- d. Displacer

Ans. D

63. Thermocouple extension wire may be readily distinguished from regular thermocouple-grade wire by which of the following?

- a. Thickness
- b. Special markings on the wire's insulation
- c. Different metal types
- d. Outer sheath color

Ans. D

64. A flag flapping in the breeze illustrates what type of dynamic fluid effect is from which of the following?

- a. Vortex shedding

- b. Transitional flow
- c. Laminar flow
- d. Coriolis effect

Ans. A

65. For accurate operation, orifice plate flow meters require which of the following?

- a. Transitional flow
- b. Swirls and eddies in the flow stream
- c. Plug flow
- d. Fully-developed turbulent flow

Ans. D

66. Which of the following characterizes Cascade control?

- a. two controllers whose outputs are selected either by high or low value
- b. presence of a "dead time" relay or function block
- c. special relay or function block to compensate for nonlinear process gain
- d. one controller providing a set point for another controller

Ans. D

67. The input signal to an electronic transmitter may be from which of the following?

- a. voltage signal
- b. mechanical signal
- c. controller
- d. primary signal

Ans. B

68. Where should you look up the meaning of a symbol on a on the P&ID?

- a. Master sheet
- b. Safety manual
- c. Procedures manual
- d. Maintenance procedures

Ans. A

69. Which of the following describes Quarter-wave damping?

- a. condition of good control where oscillations quickly subside
- b. condition of poor control where oscillations continue at constant amplitude
- c. condition of good control where PV approaches SP without overshoot
- d. condition of poor control where the transmitter is damped by 25%

Ans. A

70. An incompressible fluid moves through a restriction from which of the following?

- a. Velocity increases and pressure increases
- b. Velocity decreases and pressure increases
- c. Velocity decreases and pressure remains the same
- d. Velocity increases and pressure decreases

Ans. D

71. An air-to-close control valve assembly may be formed with which of these actuator/valve body combinations?

- a. Direct-acting actuator, reverse-acting valve body
- b. Direct-acting actuator, direct-acting valve body
- c. Reverse-acting actuator, reverse-acting valve body
- d. B or C

Ans. D

72. What does this indicate when the wire is disconnected from the fuel gauge sending unit which is a bimetallic gauge. A voltmeter connected to the wire reads a pulsating 5v?

- a. properly operating IVR (instrument voltage regulator).
- b. defective IVR (instrument voltage regulator).
- c. sending unit is operating properly.
- d. defective fuel gauge.

Ans. A - IVR regulates voltage to a 5 volt signal

73. Reset control action is often expressed in units of which of the following?

- a. repeats per minute
- b. seconds per rate
- c. percent
- d. minutes

Ans. A

74. A purely integrating processes typically respond well to aggressive control action?

- a. Derivative
- b. Nonlinear
- c. Linear
- d. Proportional

Ans. D

75. How long is the sling on a double-wrap choker hitch that must be used on a 24" pipe.

The measurement from the top of the pipe to center of the hook is 7.44'?

- a. 20ft
- b. 18ft
- c. 22ft
- d. 15ft

Ans. A

76. What should be done first before connecting an ohmmeter to a circuit?

- a. Install new batteries.
- b. Set the range selector to the highest range.
- c. Check the circuit with a voltmeter to make sure the circuit is not powered.
- d. Operate the circuit.

Ans. C

Voltage will damage the ohmmeter. Verify the circuit is electrically dead.



77. An alkaline solution has a pH value of which of the following?

- a. at least 10
- b. greater than 5
- c. greater than 7
- d. less than 5

Ans. C

78. Given a pressure drop of 19 PSID, a specific gravity of 0.9, and a maximum flow rate of 250 GPM. Calculate the necessary Cv rating for a liquid service control valve. Assume there will be no flashing or choked flow through the valve?

- a. 54.41
- b. 27.96
- c. 14.84
- d. 61.486

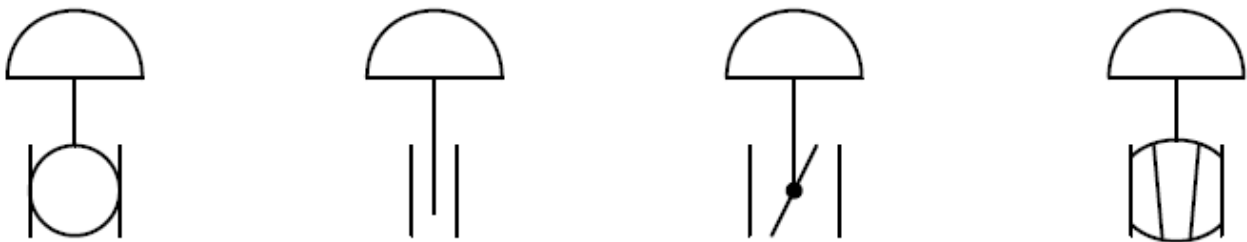
Ans. A

79. When a control valve is installed in a process with nearly constant differential pressure (drop) across the valve, the best trim characteristic to choose for the valve would be:

- (A) Equal percentage
- (B) Quick-opening
- (C) Hyperbolic
- (D) Linear
- (E) Anti-cavitation

Ans: D

80. The correct identities of the four control valve types shown below are (in order from left to right):



- (A) Globe, Butterfly, Disc, Ball
- (B) Ball, Disc, Butterfly, Globe
- (C) Diaphragm, Gate, Disc, Globe
- (D) Ball, Gate, Butterfly, Plug
- (E) Plug, Slide, Rotary, Ball

Ans: D

81. An air-to-close control valve assembly may be formed with which of these actuator/valve body combinations?

- (A) Direct-acting actuator, reverse-acting valve body
- (B) Direct-acting actuator, direct-acting valve body
- (C) Reverse-acting actuator, reverse-acting valve body

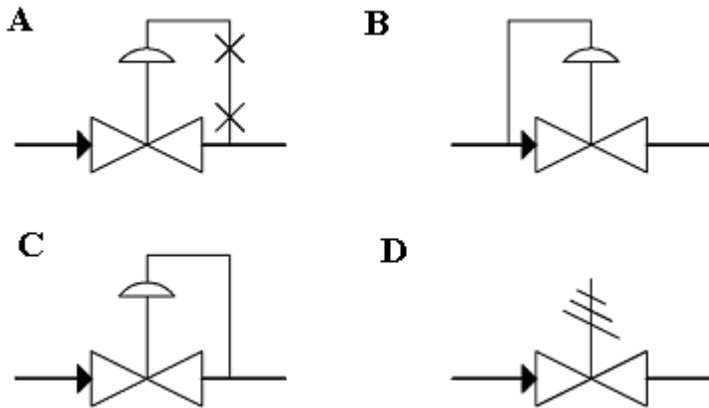
- (D) B or C
  - (E) A or B
- Ans: D

82. The main purpose of a control valve positioner is to:

- (A) Alter the fail-safe status of the valve
- (B) Alter the characterization of the valve
- (C) Improve the precision of the valve
- (D) Increase transmitter accuracy
- (E) Eliminate cavitation in the valve

Ans: C

83. Which of the following symbols is used to indicate a temperature regulator?



Ans. A - This symbol reflects a temperature regulator, filled thermal system.

84. Which of the following network security technologies does not use encryption?

- a. Virtual Local Area Network (VLAN)
- b. Wired Equivalent Privacy (WEP)
- c. Virtual Private Network (VPN)
- d. Digital Signatures

Ans. A