Performance Based Objectives – Instrumentation*

PBO No.	Performance Based Objective
IN-1	Convert PSIA readings to PSIG, inches of mercury, inches of water, Bars, and Atmospheres. (Written exercise)
	Solve for the missing variables in the following equations: (Written exercise)
	F = P x A
	E = I x R
	F = 9/5 x C + 32
	C = (F – 32) x 5/9
	Density = Mass / Volume
	Flow rate = Volume / Time
IN-2	List the advantages of a 4–20 milliamp Current loop as compared to other forms of data transfer in an industrial environment (Written exercise)
IN-3	Given transmitter current (4–20 ma) and the input resistance of a receiving device, calculate the input voltage under changing conditions (i.e. changing power supply voltage, additional series connection resistance, etc.) (Written exercise with calculator)
IN-4	Match process control characteristics with the following control schemes: Open Loop, Closed Loop On-Off control, proportional control, Proportional plus Integral control and PID control. (Written exercise with book reference)
IN-5	Match all of elements in a PID controller with their purpose. (Written exercise with book reference)
IN-6	Match all common devices used in instrumentation applications with their proper symbols. (Written exercise with book reference)
IN-7	Identify common Pressure transducers and match them to a description of operation and their symbol. (Written exercise with book reference)
IN-8	Identify common Temperature transducers and match them to a description of operation and their symbol. (Written exercise with book reference)
IN-9	Identify common flow transducers and match them to a description of operation and their symbol. (Written exercise with book reference)
IN-10	Identify common level transducers and match them to a description of operation and their symbol. (Written exercise with book reference)
IN-11	Identify common Analytic transducers and match them to a description of operation and their symbol. (Written exercise with book reference)
IN-12	Using a Hart Protocol Communications device, connect to a transmitter and record the displayed process variables. (i.e. measured variable, upper and lower range limits, Analog output, etc.) (Hands-on exercise with Hart communicator & working transmitter)
IN-13	Using a Hart Protocol Communications device, connect to a flow transmitter and perform a loop test. (Hands-on exercise with Hart Communicator & working transmitter)
IN-14	Using a Hart Protocol Communications device, connect to a flow transmitter and change the Upper and Lower Range values. (Hands-on exercise with Hart Communicator & working transmitter)

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PBO No.	Performance Based Objective
IN-15	Using commercial websites locate and download specifications on selected transducers, transmitters and actuators. (Exercise using the Internet)
IN-16	Wire a differential pressure transducer/transmitter to a load and measure output current under varying input conditions noting that variations in supply voltage and load resistance do not affect output current. Adjust Upper and Lower range values. (Optional – pending equipment availability)
IN-17	Manually adjust the zero and span points on a transmitter without a Hart Protocol Communications device. (Hands-on Lab exercise)
IN-18	Wire a thermocouple to an intelligent transmitter, and using a Hart Communicator set the Upper and Lower range values. Note the output current with changing temperature to verify the new range values. (Hands-on Lab exercise)
IN-19	Demonstrate the proper use of a current source simulator, process meter (Fluke) and Milliamp clamp on ammeter. (Hands-on exercise)
IN-20	Given plant Instrumentation prints, identify all symbols, connections, loops and sub-loops. Identify the state of digital (PLC) outputs necessary to actuate all control and proportioning valves in the system. (Written exercise with book reference)
IN-21	Given the following: - Instrumentation drawing - PLC I/O diagram - All field voltages under a faulted condition and currents as measured with an ammeter Troubleshoot and identify the faulted component(s) and describe additional actions that could be further taken to isolate the faulted device.

***This is a process control class. PID set-up, Calibration and Loop tuning will be offered in a second class.**

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