Pretest Programmable Logic Controllers

Unit 1, Task 1

1. What is a PLC? (Digital electronic apparatus with a programmable memory.)

2. What are the four main components of a PLC? (Input section, CPU section, Programming Device, Output section)

3. What is a discrete device? (Two states, On and Off)

4. What is a pulse-generating device? (Shaft Encoder)

5. What term is used to describe the CPU in a PLC? (Brain)

6. What is the difference between a communication port and a programming port on a PLC? (Programming Device-Programming Port, Other PLC-Communication Port)

7. What is an Uninterruptible Power Supply? (UPS) (Clean AC Power source)

8. What is the expected life of a lithium battery? (Up to 15 years)

9. What is the typical maximum amperage for switching with the output section of a PLC? (Typically 10A max)

10. What are the three main categories of loads controlled by a PLC? (Discrete, Analog, Pulse)

11. What are the two main parts of a PLC programming device? (Display and Keyboard)

12. What are the four functions of a PLC programming device? (Program Entry, Documentation, Run, Monitoring)
13. What is the difference between a dumb terminal and an intelligent one?

(Intelligent can program without being connected to PLC, Dumb must be
corresponded to PLC for programming)

14. What is one characteristic of a hand-held programmer? (Designed for use with a
specific PLC)

15. What is one disadvantage of a hand-held programmer? (Only display a small
amount of the program at a time)

16. What are full-size dedicate terminals? (Have a CRT {Cathode Ray Tube} and a
specialized keyboard)

17. What is boilerplating and what is the advantage of using it? (Using a template to
copy blocks and use them over and over)

18. What is emulation software? (Allows a program to actually run without being
connected to a PLC.)

19. What is the next step when a new program is installed and the computer is put in
the run mode? (De-bugging)

20. What is the purpose of LCD and LED readouts? (Convey message about status of
a machine.)

21. What are the main advantages of PLCs? (Reliability, Flexibility, Expandability,
Accuracy, Ease of installation, and Maintainability.)

**Task 2**

1. What is a byte? (Group of 8 bits)

2. What is a word length? (16 Bits or two bytes)

3. What is executive memory? (Comes from factory and never changes)
4. What is user memory? (User program and data can be changed)

5. What is EEPROM? (Electrically-Erasable Programmable Read-Only Memory)

6. What is UVPROM? (Ultra-violet Programmable Read Only Memory)

7. What is NOVRAM? (Non-Volatile Random Access Memory)

8. What is the address of the first input for most addressing schemes? (I/O)

Task 3

1. What is the physical link between field equipment and the CPU? (I/O Modules)

2. What is a remote I/O? (Mounted in a rack separate from the main CPU)

3. What is a discrete I/O? (Two possible states, On or Off)

4. What is the purpose of the isolation circuit in an I/O module? (Isolates the input signal from the processor signals)

5. What is the purpose of an Opto-isolater? (Same as above)

6. What voltage level does the TTL logic family operate at? (5V DC)

7. How is the AC output protected? (2 types) (Metal Oxide Varistor and RC Snubber)

8. How are DC outputs protected? (MOV)

9. Which type of output uses SCRs for switching? (AC output module)

10. Which type of output uses transistors for switching? (DC output module)

11. What is one other type of output? (Contact outputs)

12. How are analog signals converted to digital signals for the processor? (“Smart card” modules change the analog input to digital with their own processor)
13. Name three analog inputs and outputs. (Temperature, pressure, load cell, and humidity transducers, control valves, actuators, motor drives, chart recorders, pressure transducers)

14. What precaution should be taken when connecting analog devices? (avoid noise) (Shielded cable)

15. What is the purpose of filtering circuits in input modules? (Suppress contact bounce and remove transients)

16. Which input module contains a rectifier? (AC or DC) (AC)

17. What are the four main functions of an input module? (Termination, Signal Conditioning, Isolation, and Indication)

18. Modules are designed to be removed/replaced under power so additional precautions are unnecessary. True or false. (False)

19. What does a noise debounce filter do? (Removes AC noise and provides delay to eliminate contact bounce)

20. What is threshold detection? (Zener diode will not allow current flow until the signal is above the rated level)

21. What is the difference between “sinking and sourcing”? (Negative wire taken to devices first sourcing, Positive wire taken to devices first sinking)

22. Which input devices require three wires? (Photoelectric and proximity switches)

23. How is leakage current from a TRIAC or SCR sensor output kept from being read as a true input? (Installing a resistor across the load to lower impedance.)

24. What are the four basic functions of an output module? (Termination, noise suppression, Isolation, and Indication)
25. What are an R-C snubber and a MOV? (Components that suppress electrical noise and protect the contacts from overvoltage)

26. What is the most common switching mechanism for the output module? (Triac for AC and Power Transistor for DC)

27. What is the difference between sinking and sourcing currents in an output module? (Module switches the positive line-sourcing, negative line-sinking)

28. What is an isolated output? (Each output has a separate, independent return line)

29. Are isolated outputs interchangeable between AC and DC? (No)

30. How is switching of larger currents accomplished using contact outputs? (N.O. or N.C. Relay contact)

31. What precaution must be taken when removing a field device from an output module that utilizes a triac switch? (Shock Hazard, Lockout)

32. What is the purpose of connecting a resistor across a neon lamp in an output module? (Keep the trickle current from lighting the lamp giving a false indication)

33. What are interposing relays used for? (Switching Larger voltages or currents)

34. What values should be checked before installing a replacement output module? (Voltage and current)

**Task 4**

1. What is the best guide when installing a PLC system? (Prints and Specs)

2. A PLC can withstand most any temperature. True or False? (False, typically 5-40 deg C)

3. PLCs are intrinsically safe as they operate at lower voltages. True or False? (False)
4. How should communication cables cross power cables? (Right angles)

5. Is it more important to shield input cables or output cables from noise? (Input, may cause false input signal initiating and action)

6. Where should shielded cables be grounded? (How many points) (One point only, typically the supply end)

7. What color is the wire that connects a ground pad to the service ground electrode? (Green)

8. How should multiple shields be grounded? (Radially)

9. What is the recommended source of power for a PLC? (Uninterrupted Power Supply)

10. What does “More than 1 live circuit” indicate on a motor starter? (One switch may not disconnect all the power)

11. Where is a “Master control relay” typically controlled from? (Master pushbutton in operators panel)

12. When is a master control relay used? (Emergency)

13. When is a master control relay not a good idea? (It controls outputs only)

14. Is all program data lost when a battery is replaced in a PLC? (No, it can be done without loss of data or program)

Unit 2, Task 1

1. Which component of a PLC contains the microprocessor? (CPU section)

2. Which component of a PLC executes the logic program? (Processor)

3. What are the three main functions of a processor? (Communicate with modules, execute the logic program, and communicate with the programmer)
4. What are the two basic parts of a processor scan? (I/O update and program scan)

5. What is the term used to describe the process of reading inputs and writing to outputs based on a program in a PLC? (I/O update)

6. What is the term used to describe the process of executing a series of instructions that control the output sequence in a PLC? (Program scan)

7. What is the main task of the CPU? (Reading, solving, and writing to outputs)

8. What are three factors that affect scan time for a CPU? (Speed of CPU, length of ladder logic program, and I/O points to service)

9. What problem occurs if scan time is too long? (High speed input transactions may be missed)

**Task 2**

1. Why are electricians so comfortable with ladder logic? (Similar to schematic diagrams)

2. Why is it called “Ladder logic”? (Has 2 rails and rungs, looks like ladder)

3. How are contacts connected for the Boolean mnemonic A or B = C? (Parallel)

4. How are contacts connected for the Boolean mnemonic A and B = C? (Series)

5. Structured Text and Function Block are two types of what? (Computer languages)

6. Where is the output energize or coil instruction programmed? (Right rail)

7. What is a “true” rung? (Continuous path can be traced from left rail to output instruction)

8. What is the meaning of the term “Examine if on”? (If the bit is on, the instruction is true like a normally open contact)
9. What is the meaning of the term “Examine if off”? (If the bit is off the instruction is true like a normally closed contact)

10. How many bytes of data are required to represent the state of 32 inputs? (4)

11. What is a latching relay? (Allows a bit to set when a coil is made true and remain true when the rung goes false)

12. What happens to a latched bit when the processor power is turned off? (Remains latched)

13. What precaution must be taken when using a latching relay? (Machinery may start up with no one present when power is restored)

14. What type of bit has no terminal wiring associated with it? (Internal)

15. What is a “One shot” bit? (Bit that is true for only one scan)

16. What is the main advantage of PLC timers over electromechanical timers? (Accuracy)

17. What does EN represent in a timer address? (Enabled)

18. What does DN represent in a timer address? (Done)

19. When does an on-delay timer start timing? (Rung goes true)

20. What is the result of the timing control input on a timer going false during timing? (Reset to zero)

21. What is the result of the enable/reset input on a timer going false during timing? (Reset to zero)

22. How is the timer (figure 7, page 60) changed from an on-delay to an off delay? (Examine if off used with timing control input)
23. What devices typically pulse an electromechanical counter? (Limit switch, proximity switch, or photo eye)

24. How many inputs does a PLC counter typically have? What is the purpose of each? (Two, one for count input and one for reset input)

25. What does “ACC” indicate next to a value on a counter? (Accumulated)

26. What does “PRE” indicate next to a value on a counter? (Preset Value)

27. How is a PLC counter reset? (Reset input made true)

**Task 3**

1. What is required before a PLC can write to hardware outputs? (Addresses)

2. What is the purpose of the hardware input section? (Converts field signals into logic levels 0 or 1)

3. What is another name for the input image table? (Input memory section)

4. How do most PLC’s store memory information? (Binary bits)

5. In what direction on a ladder diagram does a PLC scan occur? (Top to bottom and left to right)

6. What happens to an output when there is a true path from the logical rail to the output? (Goes true and puts a logic 1 in the output table)

7. What must be added to an output that is “true” to actually control something? (Link to some physical hardware)

8. What are internal coils in PLC’s? (Memory sections that are for use in other parts of the program and have no connection to outputs)

9. Why is it important to know the order of program scanning? (Scanning order can change the way a program will operate)
10. Why is rung order important in a ladder logic program? (Actions are different if the rungs are not in order)

**Task 4**

1. How is “sealing” in accomplished in a motor control circuit with a momentary contact pushbutton? (Holding contact in parallel with the start pushbutton and controlled by the coil voltage)
2. What are two situations where it may not be a good idea to restart a machine automatically after an overload? (Conveyors and saws)
3. What is “fail-safe” wiring? (Wiring components so if they fail it will not create a hazard)
4. What type of contact or instruction should always be used for a stop button? (Examine if off)
5. What type of contact or instruction should always be used for a start button? (Examine if on)
6. How can a single pilot light indicate three states of a motor? (Off, On, or Pulse)
7. What is the purpose of a toggle operation? (Switching between two operations alternately)
8. What is a hand/off/auto switch? (To allow manual or automatic operation of equipment)
9. What is one application of an up and down counter working together? (Cars on a bridge, traffic control)
10. What is another method of providing the effect of a seal in contact? (Latching relay)
Unit 3 Task 1

1. A PC along with the application software will accomplish which five tasks?
   (Program ladder logic, Download/Upload/Write programs to/from PLC,
   Document ladder programs, Edit or modify logic programs, and Change controller
   operations)

2. What are the two modes of operation when using a PC to edit a program in a
   PLC? (Off-line and On-line)

3. What is the difference between the two modes of operation? (Off-line will not
   affect the operation of the PLC but On-line will)

4. What information is used to configure the simplest PLCs? (Setting up inputs and
   outputs, internal bits, or registers, or data storage locations)

5. What is off-line programming? (Allows changes or edits to an existing project
   resident in the PC. Changes do not affect the operations of the PLC)

6. What is another name for program lines of logic? (Rungs)

7. What is the next step after selecting an instruction type in a ladder logic program?
   (Give it an address)

8. Instruction descriptions are part of the PLC program. True or False? False

9. What must be done when a ladder logic program is completed? Saved

10. What is a software emulator? Simulation that allows program to run without being
    connected

11. What does a PLC require to be able to go on a network? Cable between the PC
    serial port and the PLC communication port

12. What process requires the PLC be stopped? Download new program to the PLC
13. Is it necessary to stop a PLC to upload the program to a file? No

14. What does the brighter intensity indicate on a highlighted ladder logic diagram on-line? Logical power flow or path of true power

15. How are display screens to monitor the status of inputs, outputs, data files, and registers typically accessed? Windows menu or function keys

16. Are output and input numbers typically shown below the tables showing the status? No

17. What are six of the search options offered by most PLC software? Input, Output, word storage, instructions, symbols, or descriptions

18. What is the main concern with on-line editing in a PLC program? Changes affect the PLCs control over outputs and data manipulation

19. What is often required before an on-line edit will affect the PLC ladder logic or off-line program? Upload or read operation

20. How are different levels of access to a PLC process or program enforced? Password protection

**Task 2**

1. What are the two main operating modes of a PLC? Run and Stop

2. Do most PLC’s allow downloading or editing while in the run mode? No

3. What is the state of the real outputs when a PLC is in test mode? De-energized

4. What is single scan mode for a PLC? (NOT A HARD QUESTION) Run through one scan of the program and set outputs

5. What is the main purpose of the single scan mode? Troubleshooting program problems
6. What is indicated by the “Outputs inhibit” light on an Omron PLC? Test mode

7. What should be done when the “Battery low” light is lit on a PLC? Replace battery or risk losing program data

**Task 3**

1. What must be done before initial startup of a PLC process system? Consult installation and operation manuals

2. What type of information should be taken from the installation drawings before starting up a system? Study drawings to locate disconnects

3. What is one problem you may encounter when all disconnect switches are opened and you want to do an electrical check of a system? UPS backup power

4. List at least four procedures that are part of a mechanical inspection prior to initial startup of a system?
   1. Welding cables, hoses, packing materials, bracing, etc. have been moved
   2. Everything is bolted down
   3. Hydraulic and pneumatic connections are complete
   4. Hydraulic tank and lube levels are good
   5. Manual shut-offs for hydraulic and air are located
   6. Energy storing devices are located and checked
   7. No workers are in the bight (jaws of equipment)

5. How is the wiring checked for proper connections? (Right wire in right place)
   Check wiring against schemogram

6. What should be done before any control power is applied to a PLC system?
   1. Turn on I/O power and CPU power
   2. Measure CPU power voltage
   3. Use status lights to verify power on, not in run mode, etc.
   4. Make sure the master control relay will shut down the proper part of the system
   5. Verify input wiring by
operating the device and checking the status light. 6. Verify the master start button will make the system work.

7. What is the easiest way to check an input signal? Indicator light

8. How can we be sure the input bit is being read by the PLC? Check if the input bit is being read into the Input table

9. When does the logic program not control the outputs? When they are forced on or off

10. What checks should be made if an output light is coming on and the device connected to it is not operating? Fuse

11. What does a fuse that blows randomly from time to time indicate? Intermittent ground, too large load, failing coil, etc.

12. How are coils, that are on, displayed on a CRT during program troubleshooting? Reverse video (Black is white and white is black)

13. What is the purpose of a “halt or temporary end” for troubleshooting? Allow a program to run up to that point

14. What is a “histogram”? Printout of events

15. What is the purpose of rung comments? Quicker analyzing

16. Why is it important to document changes to a program? So the next person will know the changes were made

17. What is included in a typical program printout? Ladder logic with descriptors, labels, rung descriptions, data table usage and cross references

18. What is typically shown on a printout that is not displayed on a programming terminal? Cross references