Title: **Introduction to PLC Final** Test: Final

Course: Introduction to Automation Unit: Introduction to PLC CLO: 4

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objectives**

1. Student shall calculate the correct number conversion base from a number of a different number base system.
2. Student shall demonstrate their knowledge of introductory PLC principles.
3. Student shall draw the output of an instruction given its input(s).

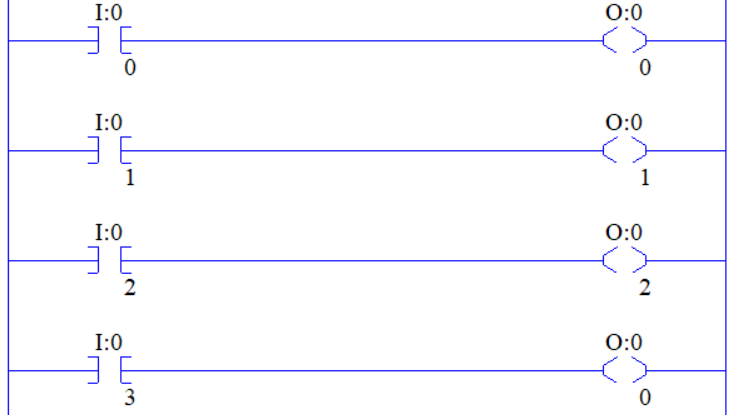
**Assessment**

Students shall demonstrate a comprehension of the objectives listed above by scoring a minimum of 75% on this Test. Grading shall be based on the answer key.

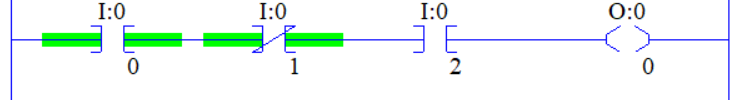
**Instructions**

Select the best answer to each multiple-choice question below.

1. How many instructions can the MicroLogix 1100 PLC perform at any one time?
   1. 4
   2. 3
   3. 2
   4. 1
2. What does the three-letter acronym, PLC mean?
   1. Programmable Ladder Computer
   2. Proportional Logic Controller
   3. Programmable Logic Controller
   4. Programmable Ladder Controller
3. Between inputs and outputs, which items can actually be controlled?
   1. Inputs
   2. Outputs
   3. Both
   4. Neither
4. How are the inputs to a PLC protected?
   1. Through a fuse
   2. Through a resettable circuit breaker
   3. Through an LED and photo transistor
   4. Through a current limiting zener
5. What component is used to relay an output signal?
   1. A coil
   2. A dry contact
   3. An LED and photo transistor
   4. A current limiting Zener
6. A collection of \_\_\_\_\_ makes up a word.
   1. Places
   2. Binaries
   3. Bits
   4. Variables
7. A word has \_\_\_\_ bits.
   1. 1
   2. 4
   3. 8
   4. 16
8. The binary number system has how many digits?
   1. 1
   2. 2
   3. 8
   4. 10
9. Why is the binary number system used for motor control/ladder logic?
   1. It’s simple
   2. It has only two states
   3. It’s not used for motor control logic
   4. None of the above
10. List the order of operation of a PLC.
    1. Scan inputs, write outputs, evaluate ladder logic
    2. Evaluate each rung reading inputs and driving outputs that are in the rung.
    3. Scan input, evaluate ladder logic, write outputs
    4. Inputs, logic and outputs are all read/evaluated/written in parallel at the same time.
11. Input addresses start with the letter \_\_\_\_
12. Output addresses start with the letter \_\_\_\_
13. Internal memory bits start with the letter \_\_\_\_
14. Review the answers for 11, 12 and 13. Describe the difference between each address type.
15. Describe the problem with the ladder logic below.



1. A number that represents a whole number.
   1. Binary
   2. Integer
   3. Float
   4. Word
2. A binary number can be converted to an integer and vise-versa.
   1. True
   2. False
3. Integers can be negative numbers.
   1. True
   2. False
4. A byte has \_\_\_ bits and can represent an integer up to \_\_\_\_\_?
   1. 8,255
   2. 16, 65535
   3. 4, 128
   4. None of the above
5. Two \_\_\_\_\_\_\_ make a word?
   1. bits
   2. nibbles
   3. bytes
   4. None of the above
6. A \_\_\_\_\_\_\_ can be broken into four words?
   1. nibble
   2. bytes
   3. DWORD
   4. QWORD
7. Does this rung have logical continuity? Why or why not?





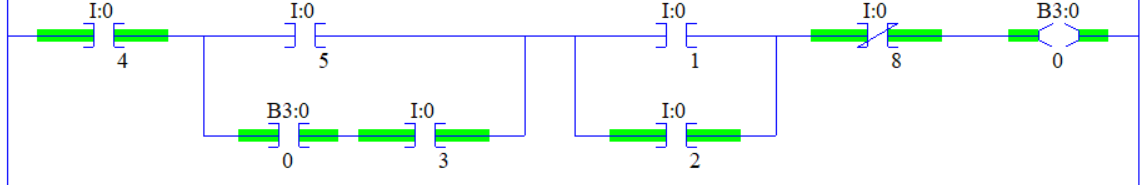
1. An XIC would be used for?
   1. Checking the status of a normally open contact
   2. Testing a set of normally closed contacts
   3. Checking to see if an address is true.
   4. Is used to test for a 0
2. An XIO would be used for?
   1. Checking the status of a normally open contact
   2. Testing a set of normally closed contacts
   3. Checking to see if an address is true.
   4. Is used to test for a 0
3. What does the instruction TON stand for?
   1. Timer over network
   2. Test for ON
   3. On-Delay Timer
   4. Table Output Numbers
4. Fill in the state of each timer bit (0 or 1).

|  |  |
| --- | --- |
|  | EN \_\_\_\_\_  TT \_\_\_\_\_  DN \_\_\_\_\_ |

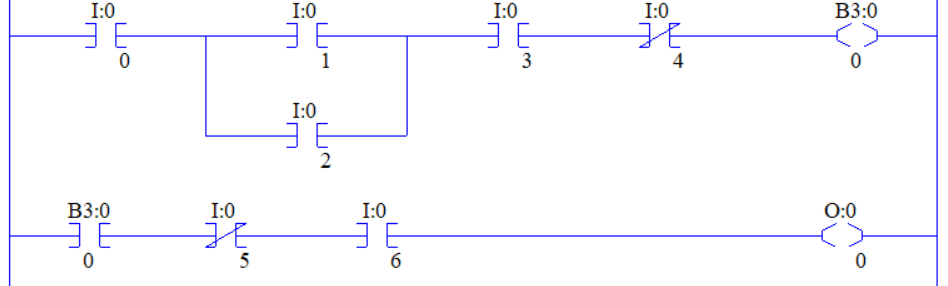
1. What does the instruction TOF stand for?
   1. Timer over force
   2. Off-Delay Timer
   3. Test for OFF
   4. Table Output Floats
2. Fill in the state of each timer bit (0 or 1).

|  |  |
| --- | --- |
|  | EN \_\_\_\_\_  TT \_\_\_\_\_  DN \_\_\_\_\_ |

1. If you want to transfer an integer value to another location, what instruction would you use?
   1. CPY
   2. MOV
   3. TRNS
   4. All the above
2. The number 123.456 is an example of an Integer.
   1. True
   2. False
3. The largest number that an Integer can be in the MicroLogix 1100 is 32,767.
   1. True
   2. False
4. Does this rung have logical continuity? Why or why not? Explain in detail.



1. An CTU would be used to?
   1. Timing a specific set of contacts
   2. Be a Clock timer unit
   3. Counting up to a certain Preset
   4. Counting down to a certain Preset
2. A CTD would be used to?
   1. Each logical continuity true transition, decrements an integer by one
   2. Subtract two numbers until they equal each other
   3. Counting up to a certain Preset then setting the done bit
   4. Is used to test for a 0 and sets the Accum value
3. What describes an Integer?
   1. Any natural number
   2. Any number that doesn’t have a fraction.
   3. Is negative or positive
   4. Both b and c
   5. All the above
4. How does a number become negative inside the PLC?
   1. The first bit indicates the sign
   2. The MSB equaling 1
   3. All the bits are 1
   4. None of the above
5. Below is a printout of a program. The current states of each input can be seen in the table below the printout. What is the value of O:0/0?

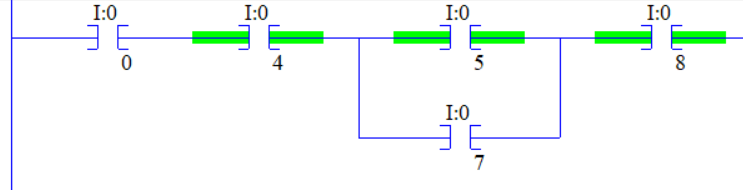




Convert the following to the indicated number base.



1. Word \_\_\_\_\_BCD
2. Byte \_\_\_\_\_16
3. Bit \_\_\_\_\_2
4. Nibble \_\_\_\_\_8
5. Does this rung have logical continuity? Why or why not? Explain in detail.



1. An EQU would be used to?
   1. Test two numbers to see if they are the same
   2. Set one number equal to another number
   3. Write a word to an integer
   4. All of the above
2. A GEQ would be used to?
   1. Make sure a number is less than a specific value
   2. Test for a number to be at least a given number
   3. Test two number to see if they are not equal
   4. None of the above
3. A OSF would be used to?
   1. Check to see if a value is ON
   2. Force an output value
   3. Indicate that a value went to 0 this scan
   4. Set if a number has been FALSE
4. A OTU would be used to?
   1. Clear a bit value
   2. Turn on a pilot light
   3. Counting up to a certain Preset then setting the done bit
   4. Is used to test for a 0
5. An ADD would be used to?
   1. Set a register based on the sum of two numbers
   2. Set a register based on the product of two numbers
   3. Set a register based on the difference of two numbers
   4. Set a register based on the dividend of two numbers
6. A SUB would be used to?
   1. Set a register based on the sum of two numbers
   2. Set a register based on the product of two numbers
   3. Set a register based on the difference of two numbers
   4. Set a register based on the dividend of two numbers
7. A DIV would be used to?
   1. Set a register based on the sum of two numbers
   2. Set a register based on the product of two numbers
   3. Set a register based on the difference of two numbers
   4. Set a register based on the dividend of two numbers
8. A MUL would be used to?
   1. Set a register based on the sum of two numbers
   2. Set a register based on the product of two numbers
   3. Set a register based on the difference of two numbers
   4. Set a register based on the dividend of two numbers

Draw the output to the following logic diagrams.



















Calculate the following number to the new number base system given the value from another number base system.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. 000101102 \_\_\_\_\_\_\_10 2. 000010012 \_\_\_\_\_\_\_10 3. 4610 \_\_\_\_\_\_ \_\_\_\_\_\_2 4. 2210 \_\_\_\_\_\_ \_\_\_\_\_\_2 5. 368 \_\_\_\_\_\_10 6. 168 \_\_\_\_\_\_10 7. 3610 \_\_\_\_\_\_\_8 8. 1610 \_\_\_\_\_\_\_8 | |  |  |  |  |  | | --- | --- | --- | --- | --- | | Truth Table | | | | | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | |

|  |  |
| --- | --- |
| 1. 2258 \_\_\_\_\_\_ \_\_\_\_\_\_2 | 1. 1678 \_\_\_\_\_\_ \_\_\_\_\_\_2 |
| 1. 010010112 \_\_\_\_\_\_8 | 1. 110010012 \_\_\_\_\_\_8 |
| 1. D2B416 \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_2 | 1. E17A16 \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_2 |
| 1. 1000 0101 1101 10102 \_\_\_\_\_\_16 | 1. 1110 1000 0000 10012 \_\_\_\_\_\_16 |
| 1. 1000 0101 1001 1000BCD \_\_\_\_10 | 1. 0001 0011 0000 0100BCD \_\_\_\_10 |
| 1. 271910 \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_BCD | 1. 768110 \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_BCD |