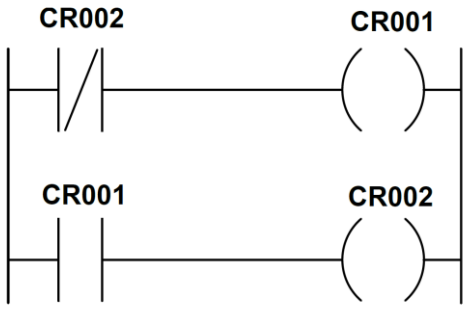
ENR 507: Industrial Automation

Date: 3rd October, 2021 – Sunday
Time: 3:30 - 4:45 pm
Total Marks: 30
Weightage: 20%
Note: Mid-semester examination of this course was taken at LIMS.

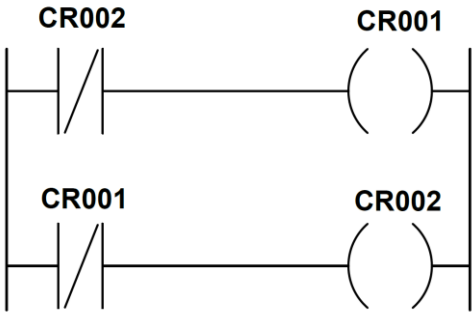
Instructions:

- All questions are compulsory.
- All acronyms carry their usual meaning.
- Assume suitable data wherever necessary and specify it clearly in your answers

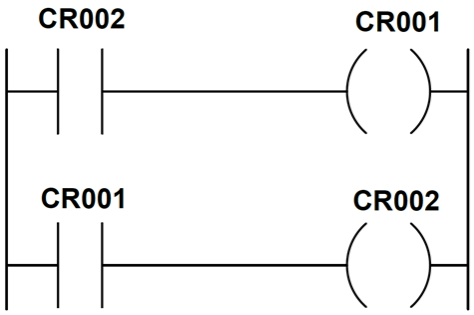
1. Draw the waveforms for outputs CR001 and CR002 when a ladder logic shown in Figure 1 is executed. Assume the total scan time (input scan, logic scan and output scan taken together) takes 1 ms. You may assume initial state of CR001 and CR002.
[2]



2. Draw the waveforms for outputs CR001 and CR002 when a ladder logic shown in Figure 2 is executed. Assume the total scan time (input scan, logic scan and output scan taken together) takes 5 ms. You may assume initial state of CR001 and CR002.
[2]



3. Draw the waveforms for outputs CR001 and CR002 when a ladder logic shown in Figure 2 is executed. Assume the total scan time (input scan, logic scan and output scan taken together) takes 3 ms. You may assume initial state of CR001 and CR002.
[2]

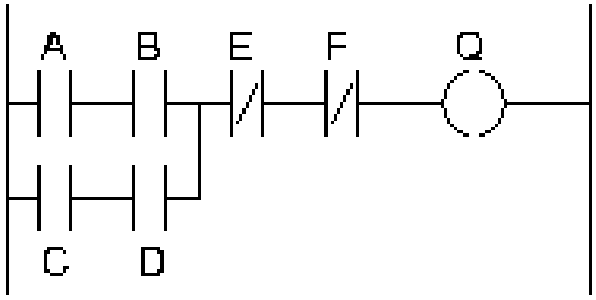


4. Convert the hexadecimal number `1EFE' to denary and binary numbers. Hexadecimal is number representation with base 16 and denary is number representation with base 10.

[2]

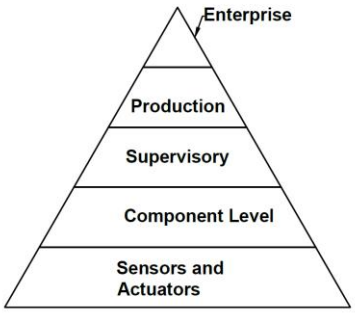
5. Write the Boolean Expression of the arrangement in Figure.

[2]



6. List various examples of each layer of the automation pyramid, shown in Figure, for a soft drink manufacturing and packaging plant.

[2]



7. Write the Boolean expression and draw the gate logic diagram and typical PLC ladder logic diagram and typical PLC ladder logic diagram for a control system wherein a pilot light is to run only when all of the following conditions are met:

[3]

- Input A is off
- Input B is on and C is off or Input B is off and C is on
- Inputs D and E are both on
- One or more of inputs F,G, or H are on.

8. In a wood cutting machine, there are three major components. A wood saw W, a fan F, and a lubrication pump P. Please note the following for its operation:

[7]

- All three turn on when a start push-button is pressed.
- A stop push button immediately stops the saw W only. The fan F is run an additional 5 seconds to blow the chips away. The lube pump P is to run for 8 seconds after the shutdown of W.
- If the saw W has run more than one minute, the fan should stay on indefinitely. The fan may then be turned off by a separate fan reset button.

9. Clearly mention all the names and brief description of all inputs, outputs and logical contacts.

[8]

- Write a program to operate a light according to the sequence
- A momentary pushbutton is pressed to start the sequence.
- A light is switched on and remains on for 2.5s.
- A light is then switched off and remains off for 1.5s.
- A counter is incremented by 1 after this sequence.
- After the fifth count, the sequence will stop and counter will be set to zero.

Clearly mention all the names and brief description of all inputs, outputs and logical contacts.