

MANIPAL INSTITUTE OF TECHNOLOGY

A Constituent Institution of Manipal University

SIXTH SEMESTER B.TECH. (INSTRUMENTATION AND CONTROL ENGG.)

END SEMESTER EXAMINATIONS, APRIL/MAY 2017

SUBJECT: INDUSTRIAL AUTOMATION [ICE 3201]

Time: 3 Hours

MAX. MARKS: 50

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Instructions to Candidates:

✤ Answer ALL questions.

✤ Missing data may be suitable assumed.

- 1A. Explain different types of redundancy techniques used in PLC-SCADA configuration. 4
- **1B.** List the advantages and disadvantages of Programmable Logic Controllers over PC
- Design ladder logic that uses normal timers and counters to measure times of 50.0 days. 3 Mention minutes, hours and days.
- 2A. Explain LIMIT instruction of PLC and also mention its application.
- **2B.** Explain the following:
 - i) Latching technique of ladder logicii) PLC Output Module.
- 2C. Write SFC and instruction list for the following liquid level system. Liquid level system 4 consists of two level sensors A, B and a motor. Sensor A is placed at top of the tank and sensor B is placed at middle of the tank. Initially the tank is empty and at this condition motor should be ON. Once the liquid level reaches to sensor A motor should be turned OFF. Motor should be in OFF condition until liquid level drops below sensor B. when liquid level drops below sensor B, again motor should be turned ON and maintains the ON condition until level reaches to A. Use one start and stop buttons. Draw the truth table for this liquid level system.
- **3A.** Write ladder logic for automatic testing machine shown in Figure 3A. The operation of the **4** testing machine is described below,
 - I. Master ON is pressed to start the operation.
 - II. If a glass is detected on conveyor, the conveyor will start to move.
 - III. If the glass reaches inspection station, then the conveyor will stop.
 - IV. 15 seconds of time delay is given for operator to inspect. After time delay a lamp glows.
 - V. Now the operator needs to acknowledge if the glass is OK or NOTOK by pressing green or red push buttons respectively and then lamp goes off.
 - VI. If the glass is OK then conveyor starts to continue the operation.
 - VII. If the glass is NOTOK start the conveyer with a delay of 3 seconds to continue the operation
 - VIII. Master OFF is pressed to stop the operation.
 - IX. An emergency stop button will reset the operation at any instant.

ICE 3201



Motor

Figure 3A.

Inputs:

- I0.0 Master ON
- I0.1 Master OFF
- I0.2 Emergency stop
- I0.3 Glass detection sensor
- I0.4 OK button

I0.5 – NOT OK button

Outputs

Q0.0 - conveyor motor

- Q0.1 Lamp
- **3B.** With a motor cycle testing application, Describe the need of SKIP instruction in PLC.
- **3C.** Illustrate Remote Terminal Unit (RTU) transmission mode technique of Modbus protocol.
- **4A.** With an application, describe Direct Digital Control.

Sensor

- **4B.** With neat diagram, explain the architecture of Distributed control system.
- 4C. A machine ejects parts into three chutes. Three optical sensors (A, B and C) are positioned in 2 each of the slots to count the parts. The count should start when the reset (R) button is pushed. The count will stop, and an indicator light (L) turned on when the average number of parts counted equals 100. Write a ladder logic for the above problem.
- **5A.** Describe the multi drop network mode of HART protocol.
- **5B.** With a neat flow chart, explain the Proportional plus Integral controller.
- 5C. A handicap door opener has a button that will open two doors. When the button is pushed 2 (momentarily) the first door will start to open immediately, the second door will start to open 2 seconds later. The first door will stay open for a total of 10 seconds, and the second door will stay open for 14 seconds. Use a timing diagram to design the ladder logic.

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