Reg. No.



MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

A Constituent Institution of Manipal University

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

END SEMESTER EXAMINATIONS, JUNE 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 suitably assumed.
- 1A. Illustrate medium facility redundant SCADA system.
- **1B.** List the OSI layers and describe data link and user layers of the field bus protocol.
- **1C.** A wrapping process is to be controlled with a PLC. The general sequence of operations is described below. Develop the ladder logic using timing diagram.
 - I. The folder is idle until a part arrives.
 - II. When a part arrives it triggers the part sensor and the part is held in place by actuating the 'hold' actuator.
 - III. The first wrap is done by turning on output 'paper' for 1 second.
 - IV. The paper is then folded by turning on the 'crease' output for 0.5 seconds.
 - V. An adhesive is applied by turning on output 'tape' for 0.75 seconds.
 - VI. The part is released by turning off output 'hold'.
 - VII. The process pauses until the part sensors go off, and then the machine returns to idle.
- 2A. With an application, describe supervisory control.
- **2B.** Draw the scan cycle of a PLC. How self-diagnosis is performed in PLC?
- 2C. A buffer can hold up to 10 parts. Parts enter the buffer on a conveyor. As parts arrive they trigger an input sensor. When a part is removed from the buffer they trigger the exit sensor. Write a program to stop the conveyor when the buffer is full, and restart it when there are fewer than 10 parts in the buffer. As normal the system should also include a start and stop button. Write instruction list and ladder logic for the above problem.
- 3A. Describe different types of interlocking techniques used in PLCs.
 3B. Illustrate the need of PLCs in process control industries with a suitable example.
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 3C. With a motor cycle testing application, Describe the need of MCR instruction in PLC.
- 4A. Illustrate split range operation of HART protocol and mention the need of isolating 4 amplifier in the HART protocol.
- 4B. With a neat flow chart, describe the linearization of process variable over a specified 3 limits using look up table method.

- **4C.** Write a ladder logic to find the average of the first 100 odd numbers.
- 5A. Explain different types of networking levels used in industries with PLC 4 configuration.
- 5B. With an example, describe the cyclic redundancy check performed in the RTU 4 transmission mode of the Modbus protocol.
- **5C.** A temperature control system consists of two thermostats with a setting of 400° C and 600° C to activate a heating element. Develop ladder logic and sequential function chart so that the temperature is maintained between 400° C to 600° C (i.e heating element remain ON up to 600° C in increasing mode and remain OFF up to 400° C in decreasing mode).

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