Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

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

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: LOGIC AND DISTRIBUTED CONTROL SYSTEMS [ICE 413]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitably assumed.

1A. Explain the general features of a SCADA system. **4**

1B. List the advantages and disadvantages of Programmable Logic Controllers over PC. **2**

1C. Design an alarm that provides a logic high of 5V when a liquid level exceeds 4.2m.The level has been linearly converted to a 0-10V signal for a 0.50 –m level. **4**

2A. List the four major parts of a PLC system in block form and how they are interconnected **4**

2B. Explain the following: **3**

i) Interlocking technique of ladder logic ii) Power supply of PLC

2C. Draw the ladder logic and instruction list for the following liquid level system. Liquid level system consists of a motor and two level sensors A & B. Sensor A is placed at top of the tank and sensor B is placed at middle of the tank. Initially the tank is empty, 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. **3**

3A. Draw the ladder logic for automatic drilling machine shown in Figure 3A. The operation of the drilling machine is described below, **4**

i. Component is placed in fixture manually.

ii. Master ON push button is pressed to turn ON the machine.

iii. System is put in Auto mode by pressing Auto mode push button.

iv. Door sensor is used to sense the door close or not.

v. A signal from door sensor will clamp the component.

vi. After 3 seconds delay spindle motor is turned ON.

vii. After 2 seconds delay Coolant motor is turned ON.

viii. Drilling arm moves down until reed switch 1 (RS1) is sensed.

ix. After drilling operation, the arm moves up until reed switch 2 (RS2) is sensed.

x. Coolant motor turns off.

xi. Safety door is opened.

xii. Component unclamps.

3B. Describe the operation of the eight lines MCR function in PLC system. (MCR0132 003). **3**

3C. With a neat timing diagram, explain positive edge triggered UP/DOWN counter. **3**

4A. Illustrate the Master-Slave mode in HART Communication Protocol. **4**

4B. With a neat diagram, explain the elements of Distributed Control System. **4**

4C. Define polling of HART protocol. **2**

5A. Describe the method of operation of (point to point mode) HART protocol using FSK principle. **4**

5B. Write a short note on the structure and elements of a HART telegram. **4**

5C. Mention the need of isolating amplifier and multiplexer in the HART protocol. **2**

6A. Design the Batch/Sequence operation display in block diagram form in DCS system. **4**

6B. Explain the configuration of DCS system and its two applications. **3**

6C. Create a ladder logic program that will start when input A is turned on, for the series X= 2[LN(n)-1]. The value of n will start from 0 and will increase by 2 until n=20 with each scan of the ladder logic. While the sequence is being incremented, any change in A will be ignored. **3**

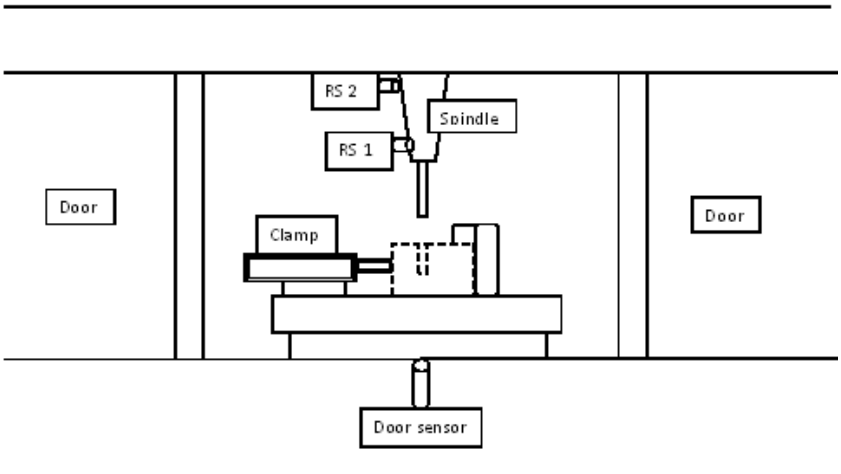

Fig.Q3A.