Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Regular Examination January / February 2011

Subject code: 710305 N
Subject Name: Programmable Logic Controller

Date: 04 /02 /2011 **Time: 02.30 pm – 05.00 pm**
Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Explain the difference between data processing computer and process control computers. Draw functional block diagram of PLC. **07**

(b) Describe PLC Processor with block diagram. **07**

Q.2 **(a)** Explain PLC process scanning technique. **07**

(b) Enumerate types of PLC modules and explain any one type of output module showing it's internal functional block diagram. **07**

OR

(b) Enumerate various input analog devices which can be interfaced with PLC and explain any one inductive type device in brief. **07**

Q.3 **(a)** Draw physical symbol of following I/O devices: **07**
1)Vacuum switch 2)Temperature switch 3) Two position selector
4) Limit switch 5) Shunt field type DC motor 6) solenoid valve 7) Buzzer

(b) Draw PLC ladder diagram for following (assume suitable data) :- **07**
1) Motor Forward-Reverse control 2) Motor start-stop-jog circuit

OR

Q.3 **(a)** Implement following Boolean functions with Ladder Logic Diagram:- **07**
1) $F= (A\cdot B)' + ((A+C+D)' \cdot (B+E))$
2) $F1 = (A+B)' \cdot (C+D)$
$F2 = (C\cdot E) + (B+E)'$
$F3=F1 \ominus F2$ (Exclusive OR function)

(b) Explain on-delay and retentive timers with necessary timing diagrams. **07**

Q.4 **(a)** Explain PLC addition and subtraction instructions with suitable examples. Show when the output is turned on. How the fixed set point and variable upper and lower limits can be set using PLC? **07**

(b) Which are the basic comparison functions? How the other functions are derived from these functions? Explain any two comparison functions with suitable examples. **07**

OR

Q.4 **(a)** Explain PLC advanced comparison functions. **07**

(b) Explain following PLC functions with suitable examples: **07**
1) SKIP 2) Jump 3) Block Move

Q.5 **(a)** Draw schematic diagram, list the process hardware, Prepare event sequence, construct Ladder logic diagram and show I/O connection details for the following bottle filling process: **07**

Bottle is moving on conveyor belt. As soon as it comes under the tank, conveyor is stopped, tank outlet valve is open and level control system for the tank is on. As soon as the bottle becomes full, the outlet valve is closed, level control system is stopped and conveyor motor is again started and process is repeated for the next bottle. Use master start-stop control. Assume suitable data.

(b) Design Ladder logic diagrams for followings:- **07**

1) One (N.O.) push button is used to control D.C. motor ON/OFF operation. When the push button is pressed first time, relay CR1 is energized and when the same push button is pressed again, relay CR1 is deenergized. Then the same process should be repeated. A D.C. motor is powered through N.O. contact of CR1.
2) A fan F, is to be turned on when count L goes from 10 down to 0 and when either count M goes up to 20 or count N has not reached from 15 down to 0. Use master start-stop control.

OR

Q.5 **(a)** There are 30 bit patterns of 27 bits each to be moved sequentially into OR0011, one every 10 seconds. Design a double TR (Table to Register Move) functions program with a timer to accomplish the data transfer. **05**

(b) Explain PLC shift register functions with suitable example. **05**

(c) Explain matrix NAND function implementation using PLC with suitable example. Assume 8 bit PLC registers. **04**

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