

GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER–VIII • EXAMINATION – SUMMER • 2014

Subject Code: 182001**Date: 05-06-2014****Subject Name: Programmable Logic Controllers****Time: 10:30 am - 01:00 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)** What do you mean by remote I/O connections for PLC? Explain in detail. Also explain advantages and disadvantages of remote I/O connections. **07**
- (b)** Explain single channel AC input card for PLC with suitable diagram. **07**
- Q.2 (a)** With truth table and suitable example, explain latching relay instruction used in PLC programming. **07**
- (b)** List and explain different conventions used in ladder diagram. **07**
- OR**
- (b)** List and explain different conventions used in Function Block diagram (FBD). **07**
- Q.3 (a)** With timing diagram and suitable example, explain PULSE TIMER and OFF DELAY TIMER instructions in PLC programming. **07**
- (b)** Write a short note on Instruction List (IL) programming method used to program a PLC. Also list various instructions used in IL programming method. **07**
- OR**
- Q.3 (a)** List and explain different number comparison instructions used in PLC programming. **07**
- (b)** Develop and write Instruction List (IL) program for the following system: **07**
- In a system there are three normally open (NO) push button switches SW1, SW2 and SW3 and a normally closed (NC) STOP push button are given. Three outputs Q1, Q2 and Q3 of the system are to be controlled as per following requirements.
- When SW1 is pressed, Q1 will turn ON and Q3 will turn OFF.
 - When SW2 is pressed and if Q1 is ON, Q2 will turn ON. But if when SW2 is pressed and Q1 is OFF Q3 will turn ON.
 - When SW3 is pressed and if Q1 is ON, Q2 will turn OFF.
 - When SW3 is pressed and if Q3 is ON, Q2 will turn ON.
 - When a STOP pushbutton is pressed, all the outputs will turn OFF immediately.
- Q.4 (a)** A motor operation is to be controlled by PLC. The motor is operated by 400 V, 3 phase AC supply. By pressing a normally open START pushbutton, motor will be started in forward direction. When the motor is running in forward direction and if START is pressed, motor will be stopped and then can be restarted by pressing START 2 times. When normally close STOP is pressed, the motor will run in the reverse direction and motor will be stopped automatically after 10 seconds. Develop and draw ladder diagram to control the motor operation and also show connections of the system with PLC. The PLC operates with 24 V DC supply and outputs of the PLC are in the form of contacts which will become closed when the PLC energizes the outputs. **07**

- (b) Develop and draw a Functional Block Diagram (FBD) to control the three outputs A, B and C as per the logic given in flow chart of Figure 1. Moreover B or C can be started and stopped using separate pushbuttons. Assume suitable inputs if required. **07**

OR

- Q.4 (a)** The operation of a pneumatic plant is to be controlled by PLC. There are two pneumatic cylinders and inductive proximity sensors are given at both the ends of each cylinder to sense extraction and retraction of the cylinders. Initially both the cylinders will be in retracted condition. When normally open START pushbutton is pressed, after 5 seconds, first cylinder will start to extract and when extracted fully, second cylinder will start to extract and after 15 seconds. **07**

Furthermore, both the cylinders will require 2 seconds for extraction, but if by chance any of the cylinder takes more than 2 seconds for extraction, it indicates a fault in the system and in this condition both the cylinders should come in the retracted condition and system should be given reset by pressing a normally closed STOP pushbutton. If STOP is pressed at any time while the system is running, system should be reset i.e. both the cylinders will come in retracted condition.

Develop and design Functional Block Diagram (FBD) to control this system.

- (b) Develop and draw a ladder diagram to control the three outputs A, B and C as per the logic given in flow chart of Figure 1. Moreover B or C can be started and stopped using separate pushbuttons. Assume suitable inputs if required. **07**

- Q.5 (a)** When a system is controlled by PLC, explain safe STOP and non safe STOP for the system (failsafe operation). Explain using both hardware and PLC program. **07**

- (b) In automatic temperature control system of fluid is to be controlled by PLC. An electric heater is used. The heater is operated by 230 V, single phase, AC supply. A temperature sensor is used to measure temperature of fluid. The sensor output is 0V to 10V DC for the temperature range of 0°C to 100°C. The sensor output is linear with the change in temperature. There is a START (NO) pushbutton and a STOP (NC) pushbutton. The system operates as follow: **07**

- When START is pressed, initial temperature will be recorded by PLC.
- After 10 seconds, heater will turn ON and will remain ON for 1 minute.
- After 5 seconds, heater will turn again.
- The heater then will stop permanently when the temperature of the fluid exceeds 5 times than its initial temperature.
- When STOP is pressed at any time, heater will be stop and can be restarted only after 30 minutes by pressing START once again

Develop and draw ladder diagram and also draw connection of the system with PLC. The PLC works on 24 V DC supply and output of the PLC gives 10 V DC signal when output is energized by PLC.

OR

- Q.5 (a)** Explain commissioning of PLC in detail. **07**
- (b) In a mixing plant is to be controlled by PLC. There are two valves which are operated by 230 V, single phase AC supply. When valve supply will be given, valve will open and material will be added in mixing tank. A mixer is operated by 230 V, single phase, Induction motor. A normally open START pushbutton is given to start the system and a normally closed STOP pushbutton is given to stop the system. The system operates as follow: **07**

- When START is pressed, valve-1 will open and 200 kg of first material will be added in the tank.

- 30 seconds later, valve-2 will open and 100 kg of second material will be added in the tank.
- 1 minute later, mixer will ON and will remain ON for 1 minute.
- After that the system will require a break of 15 minutes and then it can be restarted by pressing START once again if required.
- A STOP button can stop the system and reset the entire system at any time.

Develop and draw the ladder diagram and also draw connections of system with PLC. The PLC works with 24 V, DC supply and output of the PLC gives 10 V, when output is energized by PLC. Assume suitable sensors and clearly mention the details of the sensors.

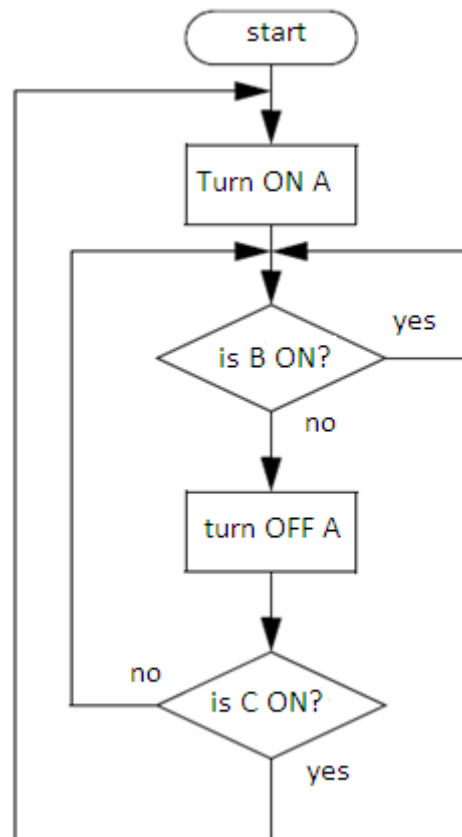


Figure 1for Q.4(b)
