

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**B.Tech. Summer2018- 19 Examination**

**Semester: 6**  
**Subject Code: 03106382**  
**Subject Name: Industrial Automation**

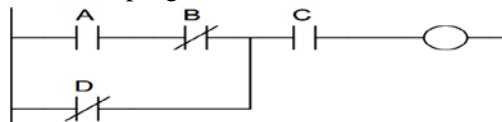
**Date: 09/05/2019**  
**Time: 10:30 am to 01:00pm**  
**Total Marks: 60**

**Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1 Objective Type Questions - ( Fill in the blanks, one word answer, MCQ-not more than Five in case of MCQ) (All are compulsory) (Each of one mark) (15)**

1. The function block that is used to start an action after a certain time is
  - (a) ON Delay timer
  - (b) Counter
  - (c) OFF Delay timer
  - (d) RS Latch
2. In a PLC, the scan time refers to the amount of time in which
  - (a) timers and counters are indexed by
  - (b) one "rung" of ladder logic takes to complete
  - (c) the entire program takes to execute
  - (d) the technician enters the program
3. The Boolean representation of this PLC program is:



- (a)  $ABC + D$
  - (b)  $ABC + BD$
  - (c)  $C + (A + B)D$
  - (d)  $C(AB + D)$
4. HMI means \_\_\_\_\_ machine interface.
  - (a) Human
  - (b) Hard
  - (c) Heart
  - (d) High
5. When a relay is NOT energized:
  - (a) There is an electrical path through the NC contacts
  - (b) There is an electrical path through the NO contacts
  - (c) Both the NO or the NC contacts have an electrical path
  - (d) Neither the NO or the NC contacts have an electrical path
6. Examine-off instruction in PLC language is symbolically represented by what shape?
  - (a) -] [-
  - (b) -]/[-
  - (c) -( )-
  - (d) None of the above
7. A level transmitter that checks the level of liquid in the tank is:
  - (a) Digital Output
  - (b) Analog Output
  - (c) Analog Input
  - (d) Digital Input
8. A central host computer server or servers called \_\_\_\_\_
  - (a) PLC
  - (b) Master terminal units (MTUs)
  - (c) DCS
  - (d) Microcontroller
9. When planning a SCADA system you should:
  - (a) Have an understanding of the process
  - (b) Collect data
  - (c) Design a database
  - (d) Design a secure system
  - (e) All of the above
10. The rung  $[-] [----] [----( )-]$  would represent what Boolean equation?
  - (a)  $X \cdot Y = Z$
  - (b)  $X + Y = Z$
  - (c)  $X \cdot Y' = Z$
  - (d) None of the above
11. An example of discrete (digital) control is:
  - (a) Controlling the speed of a fan
  - (b) Varying the volume of a music system
  - (c) Varying the brightness of a lamp
  - (d) Turning a lamp ON or OFF
12. Can we use expansion modules, to increase the number of inputs and outputs of the PLC? (Yes/No)  
 \_\_\_\_\_

13. The \_\_\_\_\_ makes decisions and executes control instructions based on the input signals.
14. HMI communicates with other devices using \_\_\_\_\_.
15. DDE is acronym for \_\_\_\_\_.

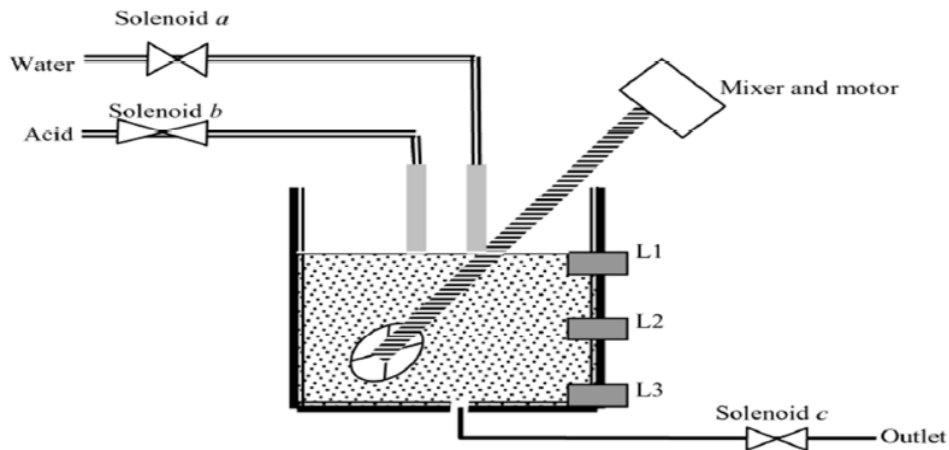
**Q.2 Answer the following questions. (Attempt any three)**

**(15)**

1. A conveyor has packs of 6 cans of soda entering it and another conveyor has packs of 8 cans of soda. Both kinds of packs are sensed by separate sensors and inputs are provided to PLC. An output indicator is to go on when a total of 200 or more cans are passed from both the conveyor. Construct the PLC ladder diagram.
2. There are three mixing devices on a processing line: A, B and C. After the process begins, mixer A is to start after 7 seconds elapse. Next, mixer B is to start 3.6 seconds after A. Mixer C is to start 5 seconds after B. All then remain on until a master enable switch is turned off.
3. An electrical plant consists of two motors M1 and M2. Motor M2 has a lubrication pump to protect its bearing. Two push buttons START and STOP are used to start and stop the plant. Motor M1 should start immediately as the START push button is pressed. After 20 sec, motor M2 along with lubricating pump should start. When STOP push button is pressed, both the motors M1 and M2 should stop immediately and lubricating pump remain ON for a time of 10 sec.
4. Construct the ladder diagram for following conditions.  
A motor M1 is to start only if start\_1 (NO) button is depressed.
  - i) It will stay running when start\_1 is released.
  - ii) Only after M1 has started may M2 be start by depressing start\_2 (NO).
  - iii) Once it is started, it will stay running even if M1 has shut down.
  - iv) M1 is stop running after M2 starts.
  - v) If at any time stop\_1 (NC) button is depressed, both motor will stop.
5. Explain the structure of Remote terminal unit (RTU). Write difference between PLC and RTU.

- Q.3** Draw the PLC Ladder diagram for a simple blending of water and acid in a container where we only have three level sensors (L1, L2, and L3) and two liquids flowing in through two solenoid valves, solenoid a(water control) and solenoid b(acid control)and draining out through solenoid c(blend outflow).The batch is to be controlled by timer. After required level of blend is sensed (by L1) the mixer runs for 01 minute by the motor. They are mixed in ratio of 3:2. The process initiates with the drain valve open, water and acid valves closed, mixer motor is off, and the tank is empty.

**(07)**



- B) Write the procedure to construct the PLC ladder diagram.

**(08)**

**OR**

- B) Describe and explain the block diagram of PLC and scan-cycle of PLC.

**(08)**

- Q.4** Draw the PLC Ladder diagram of traffic light control system for a four cross road in which there is  
A) 01 green light and 01 red light on each side. The green light should remain ON for a period of 15 seconds on one side, during which red light will remain ON in remaining sides, then repeat the sequence for each side. Also mention the input and output.

**(07)**

**OR**

- A) List the names and functions of active control elements in HMI.

**(07)**

- B) Write the advantages and disadvantages of SCADA. How does SCADA handle data?

**(08)**