

GUJARAT TECHNOLOGICAL UNIVERSITY
ME - SEMESTER-II EXAMINATION – SUMMER 2015

Subject Code: 2725407**Date: 30/05/2015****Subject Name: Programmable Logic Controllers and Applications****Time: 02:30 PM to 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) List and explain all the major components of PLCs. **07**
 (b) Explain scan cycle, scan time and significance of scan time for PLCs. **07**
- Q.2** (a) Explain digital dc output module showing its internal functional diagram. **07**
 (b) Design and PLC ladder logic diagram and PLC FBD for four digital inputs A, B, C, D and one digital output X as per following truth table. **07**

A	B	C	D	X
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	1
0	1	1	1	1
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	1
1	1	1	1	0

OR

- (b) In a system, following components/devices are to be connected with a PLC. The PLC is operated using 24V DC supply. PLC digital input level is 24V DC and output of the PLC is also 24V DC TTL signal. Draw the connections of these components/devices with PLC.
 (i) a NO pushbutton (ii) a limit switch (iii) a dc motor which is required to be operated in forward and reverse mode (iv) a temperature sensor (v) a flow sensor (vi) a 230 V, 1-phase Fan **07**
- Q.3** (a) Explain OFF delay timer instruction of PLC with timing diagram and suitable ladder logic example. **07**
 (b) Design Instruction List (IL) program to oscillate the object on the conveyor belt (shown in figure 1) between sensor 1 and sensor 2 irrespective of object position. The conveyor motor (M) is 12 V DC motor. Initially when START pushbutton is pressed object should move **07**

in forward direction. Also draw the connections of system with PLC, where the PLC is operated by 24V DC supply and PLC is having TTL type digital outputs. Assume START as normally opened and STOP as normally closed pushbuttons and both the sensors are normally opened.

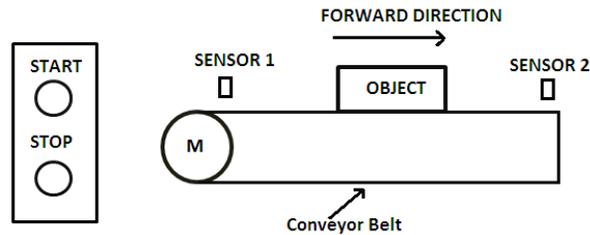


Figure 1

OR

- Q.3 (a)** Explain UP-Down counter instruction of PLC with suitable ladder logic example. **07**
- (b)** List and explain various PLC registers. **07**

- Q.4 (a)** An output X turns on by pressing NO start push button. After 10 seconds, an output Y will be turned on. 5 seconds later, output X may be turned off by pressing a NC push button. Furthermore, if X is running, an output Z can be turned on by separate NO push button. If Z is running, Y will be turned off after 5 seconds of starting of Z; otherwise Y can be turned off by separate NC push button. Design and draw PLC FBD to control the system. **07**

- (b)** Two flash lights (L1 and L2 respectively) operation is to be controlled by PLC. When START pushbutton is pressed momentarily, operation of the lights will turn ON, where L1 will remain ON and L2 will remain OFF for 5 seconds. Thereafter L1 will turn OFF and L2 will turn ON for 8 seconds. This ON and OFF process for both L1 and L2 for 5 seconds and 8 seconds will continue until a STOP pushbutton is pressed. Develop and draw ladder diagram to control this operation. **07**

OR

- Q.4 (a)** A handicap door opener has a button that will open two doors. When the button is pushed (momentarily) the first door will start to open immediately, the second door will start to open 2 seconds later. The first door power will stay open for a total of 10 seconds, and the second door power will stay on for 14 seconds. Design a ladder diagram to execute this sequence correctly. Design and draw PLC FBD to operate the system correctly. **07**

- (b)** Two feeder conveyors (F1 and F2) feed parts to main conveyor (M). Each conveyor is having sensor for counting of parts. When START pushbutton is pressed momentarily, F1 will turn ON and after feeding 10 parts to M, it will turn OFF. Then 10 seconds later F2 will turn ON and after feeding 5 parts to M, it will turn OFF. Immediately thereafter M will turn ON for 25 seconds. If STOP pushbutton is pressed at any time, the feeder which is ON will be turned OFF and the entire system will reset. Develop and draw the ladder diagram to control the system. **07**

- Q.5 (a)** Explain analog output module of PLC with suitable diagram. **07**
(b) List different arithmetic operations which can be carried out by PLC. **07**
Explain anyone arithmetic operation with a programming example in ladder diagram.

OR

- Q.5 (a)** Explain different JUMP operations in PLC with suitable example. **07**
(b) In a system, there are two analog outputs X and Y are there. There are three analog inputs A, B and C. Develop and draw a ladder diagram for the system so that the outputs vary as per following equations:

$$X=A+2B+C$$

$$Y = \frac{X}{2}$$
