Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – WINTER • 2014

Subject Code: 725405 Date: 05-12-2014

Subject Name: Programmable Logic Controllers and Applications

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 PLC architecture with suitable diagram.	**07**
	(b)	Write a short note on scan cycle of PLC. Also explain significance of scan time in PLC.	**07**
Q.2	**(a)**	List and explain different conventions used in ladder diagram.	**07**
	(b)	Write a short note of Instruction List programming (IL) used to program PLC. Also give an example of IL programming.	**07**
		OR	
	(b)	Write a short note of Function Block Diagram (FBD) used to program PLC. Also give an example of FBD programming.	**07**
Q.3	**(a)**	With suitable example and timing diagram, explain PULSE timer used in PLC programming.	**07**
	(b)	There are two motors M1 and M2. There are master ON and master OFF push buttons. Also individual ON and OFF pushbuttons are also given for each motor. Design ladder diagram to control the system as per following requirements -When master ON pushbutton is pressed, M1 should turn on. -If ON of M2 is pressed or OFF for M1 is pressed, M1 will turn off and M2 will turn on. - Now if ON of M1 is pressed or OFF for M2 is pressed, M2 will turn off and M1 will turn on. -When master OFF is pressed, whichever motor is in on condition, should turn off.	**07**
		OR	
Q.3	**(a)**	Explain down counter instructions used in PLC programming using suitable example.	**07**
	(b)	In a system there are three inputs A, B and C. There are three outputs X, Y and Z. When any of the input is high, output X will be ON and Y and Z will be OFF. When any two inputs are high, output Y will be ON and X and Z will be OFF. When all the three inputs are high, output Z will be ON and X and Y will be OFF. Design ladder diagram to control this system.	**07**
Q.4	**(a)**	List and explain different JUMP instructions in PLC with suitable examples.	**07**
	(b)	A wood saw (W), a fan (F) and a lubrication pump (P), all go on when a start button is pushed. A stop button stops the saw only. The F is run an additional 5 seconds to blow the chips away. The P is to run for 8 sec after shutdown of W. Additionally, if the saw has run more than one minute, the F should stay on indefinitely. The F may then be turned off by pushing a separate fan reset button. If the saw has run less than one minute, the P should go off when the saw is turned off. The 8 second time delay off does not take place for a running time of less than 1 minute. A stop button will stop the whole system at any time. Design ladder diagram to control this system.	**07**

OR

Q.4 **(a)** Explain analog output module of PLC using suitable block diagram. **07**

(b) In an automatic car parking system, entry and exit of a car is detected by sensors. A PLC will keep a record of number of cars enter and exit. Maximum 50 numbers of cars in the parking area. An entry gate (controlled by electric motor) will be kept open only when number of cars in the parking area is less than 50. Design a ladder diagram to control the operation of the entry gate of the car parking system. **07**

Q.5 **(a)** List and explain different number comparison functions in PLC. **07**

(b) Two feeder conveyors (F1 and F2) feed parts to a main conveyor (M). Both F1 and F2 are having ôNCô proximity sensor at the end. When ôNOô START pushbutton is pressed, F1 will be turned ON and after feeding 5 parts to M, F1 will be turned OFF. After waiting for 7 seconds, F2 will be turned ON and will remain in ON condition until it feeds 7 parts to M. When all 12 parts are arrived, M will be turned ON for 1 minute. If at any time ôNCô STOP pushbutton is pressed, all the outputs will be turned OFF. Design and draw PLC ladder diagram to control the given system. **07**

OR

Q.5 **(a)** Explain closed loop control using PLC using suitable block diagram. **07**

(b) When the start push button is pressed, a stacker (S) starts stacking metal sheets at position A. When 15 sheets are stacked there is a pause of 2 seconds and then conveyor starts and sheet moves to position B. When stacked sheets reach at the position B, conveyor stops and paint is applied for 15.5 seconds through paint spray mechanism. After painting is complete there is a pause of 1 minute. Then again conveyor starts and transfers the metal sheets to position C from where stack is removed manually. Assume that only one stack is on conveyor at a time. Add emergency stop push button to stop the process immediately. **07**

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