Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code: 725405 Date: 23-06-2014

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)**	Discuss comparison of PLC based control systems over other control systems.	**07**
	(b)	Explain DC output card of PLC with suitable block diagram.	**07**
Q.2	**(a)**	Discuss Functional Block Diagram (FBD) programming method with suitable example.	**07**
	(b)	Explain Retentive On Delay timer instruction in PLC with timing diagram and suitable example.	**07**
		OR	
	(b)	Design ladder diagram networks for the following Boolean expressions. (i) $X = A + B(A + CB + DAC) + \text{ABCD}$ (ii) $Y = (A+B\bar{A}) + \overline{(C+D+EC)}$	**07**
Q.3	**(a)**	Explain different arithmetic functions in PLC.	**07**
	(b)	How a closed loop control can be done using PLC? Explain with suitable block diagram.	**07**
		OR	
Q.3	**(a)**	Explain different data comparison functions in PLC.	**07**
	(b)	Explain analog input modules in PLC with suitable block diagram.	**07**
Q.4	**(a)**	In a system, there are two DC motors operated by 12 V supply and a lamp operated by 230V, 1-phase AC supply. When normally open ôSTARTô pushbutton is pressed, motor 1 will turn ON. After 15 seconds, motor 2 will turn ON. Motor 1 will remain in ON condition for 1 minute and motor 2 will remain in ON condition for 2 minutes. If normally close ôSTOPô pushbutton is pressed at any time, both the motors will turn OFF and lamp will turn ON. Lamp than will turn OFF when once again START pushbutton is pressed. Lamp will not turn ON if the motors have run for the specified time. Design and draw Function Block Diagram (FBD) to control the system and also draw connections of the system with PLC where PLC operates with 24 V DC supply and outputs of PLC are in form of relay contacts (i.e. PLC is having relay output cards).	**07**
	(b)	Convert the ladder diagram given in Figure 1 into Instruction List (IL) programming.	**07**
		OR	
Q.4	**(a)**	Convert the ladder diagram given in Figure 1 into Function Block Diagram (FBD).	**07**
	(b)	List different instructions of Instruction List (IL) programming and explain all of them.	**07**
Q.5	**(a)**	Design and draw ladder diagram to generate square wave at digital output terminal with ON time of 5 seconds and OFF time of 10 seconds when toggle switch is ON.	**07**
	(b)	Design and draw a ladder diagram for the equation $Y=2+\sin X+X^2$, where X is the initial value and Y is the final output.	**07**
		OR	
Q.5	**(a)**	Using suitable diagrams, explain JUMP instruction in PLC.	**07**

(b) In a temperature control system of a liquid, two heaters are used. When START (NO) pushbutton is pressed, both the heaters will turn ON. When temperature reaches 5 times than initial temperature, heater 1 will turn OFF. After 10 seconds of turning OFF of heater 1, heater 2 will turn OFF automatically. When STOP (NC) is pressed at any time, both the heaters will turn OFF instantly. Design and draw ladder diagram to control the system and also show connections of the system with PLC. Assume suitable sensors. **07**

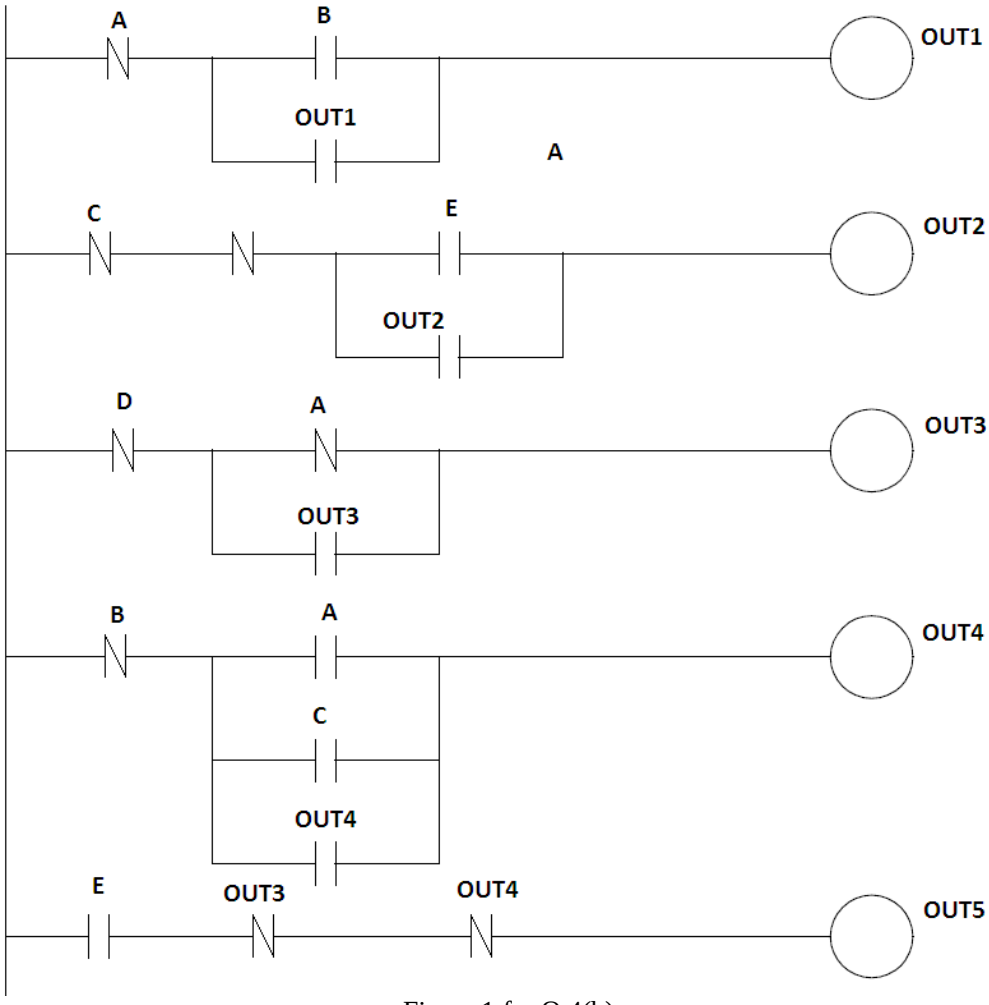

Figure 1 for Q.4(b)

****