Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject code: 1724702 Date: 18-06-2014

Subject Name: Advanced Microcontrollers and Logic Controllers

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) In a Mechatronics application, a weight is required to be measured of an object. If the weight is less than or equal to 10 Kg the object is required to be kept on Conveyor Belt no. 1 and if the weight is greater than 10 Kg then the object is required to be kept on Conveyor Belt no. 2. For the implementation of this application, describe the features required to be used from an Advance Microcontroller MSP430. **07**

(b) Explain scan time, scan cycle and significance of scan time for PLC. **07**

Q.2 (a) Explain the timer block diagram in MSP430 along with Up, Up/Down and Continuous modes of operation. **07**

(b) It is desired to generate a Pulse Width Modulated (PWM) wave with 80% duty cycle and 800 Hz frequency. Configure the Timer Special Function Registers along with timer mode in MSP430 microcontroller for this requirement. **07**

OR

(b) Explain the requirements of Watch dog timer. Describe the interval timer mode of watch dog timer to generate all supported time delays. **07**

Q.3 (a) Answer the following questions. **07**

1) Explain the internal reference voltages and buffer supported for ADC operation.
2) Explain the DAC12 Load Select option to load digital data.

(b) Explain UART communication features in MSP430 along with required baud rate generation capability. **07**

OR

Q.3 (a) Answer the following questions. **07**

1) How can you use comparator to detect threshold voltage level of 1.8 Volts in MSP430?
2) Explain the low power down mode LPM4 with its specific advantage.

(b) Explain SPI communication features in MSP430 with the help of supported signals and applications. **07**

Q.4 (a) Two feeder conveyors (F1 and F2) feed parts to a main conveyor (M). Both F1 and F2 are having óNOô proximity sensor at the end. When óNOô START pushbutton is pressed, F1 will be turned ON and after feeding 5 parts to M, F1 will be turned OFF. After waiting for 10 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 10 minutes. If at any time óNCô STOP pushbutton is pressed, all the outputs will be turned OFF. Design and draw PLC ladder diagram to control the given system. **07**

(b) Explain analog output module using suitable block diagram. **07**

OR

Q.4	(a)	List and explain different counter instructions in PLC with suitable example using any one counter.	**07**
	(b)	Write PLC Mnemonic code program to control the following system. There are three inputs M, N and P. There are three outputs A, B and C. Normally the input single is low. When any of the input is high, output A will be ON and B and C will be OFF. When any two inputs are high, output B will be ON and A and C will be OFF. When all the three inputs are high, output C will be ON and A and B will be OFF. Design and draw ladder diagram to control this system.	**07**
Q.5	(a)	There are two motors and two lubricating pumps in the system. When START pushbutton is pressed, lubricating pump 1 will turn ON. After 10 seconds, motor 1 will turn ON. 1 minute later, lubricating pump 2 can be turn ON by pressing another pushbutton if required. When motor 1 and lubricating pump 2 both are running, motor 2 will turn ON immediately. When STOP pushbutton is pressed, all will turn OFF immediately. Design and draw ladder diagram to control this system.	**07**
	(b)	Explain different arithmetic functions in PLC.	**07**
		OR	
Q.5	(a)	Explain JUMP instruction in PLC with describing its requirements.	**07**
	(b)	In a temperature control system of a material two heaters are used. To measure the temperature, a temperature sensor is used. Suppose the initial temperature of the material is X. When START pushbutton in pushed momentarily, both the heaters will turn ON. When the temperature of the material reaches at 2X, one heater will turn OFF. When the temperature of the material reaches at 3X, second heater will also turn OFF. When both the heaters are turned OFF, 30 seconds later, a lamp will turn ON. If STOP pushbutton is pressed at any time, both the heaters and lamp whichever are running will turn OFF immediately. Design and draw ladder diagram to control the system assuming suitable data for temperature sensor.	**07**

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