Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V • EXAMINATION – WINTER • 2014

Subject Code: 151704 Date: 08-12-2014

Subject Name: Industrial Control System

Time: 10.30 am - 01.00 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 the mathematical modeling of liquid level system without resistant element and outlet flow constant. Derive expression for liquid height.	**07**
	(b)	Brief about linearization of nonlinear terms.	**07**
Q.2	**(a)**	A sensor measures temperature linearly with a transfer function of 33 mV per degree Celsius and has time constant of 1.5 s. Find the output 0.75 s after input changes from 20 to 41 degree Celsius. Find the error in temperature this presents.	**07**
	(b)	Derive the mathematical model of simple RLC circuit excited with DC source and considering capacitor voltage as output. Derive transfer function.	**07**
		OR	
	(b)	Draw the block diagram of PLC system and brief about scan time. Explain use of PLC with suitable example.	**07**
Q.3	**(a)**	List different type of timers and counters in PLC and explain up counter with suitable example.	**07**
	(b)	A conveyor belt is run by switching on/off a motor. An optical detector is placed to detect the bottles. Upon detecting a bottle on the conveyor belt for 1.5 sec, the conveyor belt is stopped for 2 sec (e.g. to fill the bottle with juice). Use momentarily pressed start button and NC stop button. Light should be on when the system starts. When this repeats for 100 times (e.g. 100 bottles of juice are filled), the conveyor belt stops moving and light also turns off. Draw PLC ladder diagram to implement above scheme and explain logic.	**07**
		OR	
Q.3	**(a)**	Enlist Selection criteria for Control Valves. Also brief about types of control valves.	**07**
	(b)	Explain the concept of discontinuous control and also explain any one type of discontinuous controller with suitable diagram.	**07**
Q.4	**(a)**	Draw line symbols and prepare P&I representation of a continuous flow stirred tank reactor(CSTR) in which both the reactant effluent and the resultant by product are relieved through the same outlet. Reactor pressure is sensed and the overflow from the reactor is throttled to maintain the desired operating pressure. Process gas feed and process liquid feed streams are on flow control loop.	**07**
	(b)	Design a proportional integral controller with a proportional band of 30% and an integration gain of 0.1%/%s. Input range is 0.4 to 2 volts and output range is 0-10 V. Design circuit with op-amp.	**07**
		OR	
Q.4	**(a)**	Comment on offset in proportional action.	**07**
	(b)	Explain cascade control scheme with suitable example and list its advantages and disadvantages.	**07**
Q.5	**(a)**	Explain feed forward control scheme in detail.	**07**

	(b)	Explain ratio control with suitable example. Also discuss location of ratio-station in control loop.	**07**

OR

Q.5	**(a)**	Write a short note on SCADA.	**07**
	(b)	Write short notes on DCS system.	**07**

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