Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEM-VIII Examination May 2012

Subject code: 182604

Subject Name: Automation and Control in Rubber Industries

Date: 12/05/2012 **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 fundamental elements of an instrument.	**07**
Q. 1	**(b)**	Answer the following	
	i	Write down the purpose of an instrumentation diagram.	**02**
	ii	Give any five symbols used in an instrumentation diagram.	**05**
Q. 2	**(a)**	Which methods are available for design of rubber processing trials? Discuss any one in detail.	**07**
Q. 2	**(b)**	Answer the following	
	i	Explain the open loop control and close loop control respectively by taking suitable example of rubber processes.	**04**
	ii	Which main advantages are to be gained by using computer process monitoring in rubber industries?	**03**
		OR	
Q. 2	**(b)**	Answer the following	
	i	Write a short-note on adaptive control. Also draw block diagram of adaptive control of batch temperature in an internal mixer.	**05**
	ii	What are the objectives to carry out the sampling inspection?	**02**
Q. 3	**(a)**	Write down the working principle of thermocouple. Also discuss the various types of thermocouple used in rubber industries.	**07**
Q. 3	**(b)**	Answer the following	
	i	Define the following terms: (i) Absolute Pressure (ii) Gauge Pressure (iii) Differential Pressure	**03**
	ii	How is liquid level measured by capacitance liquid level indicator?	**04**
		OR	
Q. 3	**(a)**	How is temperature measurement carried out by pyrometer?	**06**
Q. 3	**(b)**	Answer the following	
	i	Explain the most popular hydrostatic pressure method for liquid level measurement.	**05**
	ii	Which fluids are used in manometer?	**03**
Q. 4	**(a)**	Derive the first order differential equation representing the dynamic behavior of thermometer with necessary assumptions.	**07**
Q. 4	**(b)**	Answer the following	

	i	Define the following terms: (i) Desired Value (ii) Set Value (iii) Deviation (iv) Offset		**04**
	ii	Derive the transfer function for proportional controller.		**03**
		OR		
Q. 4	**(a)**	Derive the step response equation for first order control system. Also discuss the step response curve for first order system.		**07**
Q. 4	**(b)**	Answer the following		
	i	Write in brief about the servo problem and regulator problem respectively.		**05**
	ii	Explain the term comparator.		**02**
Q. 5	**(a)**	Answer the following		
	i	A step change of magnitude 4 is introduced in proportional integral controller. If the value of k_c is 6 and integral time is 2, plot the response of controller.		**04**
	ii	Write a sort note on virtual instrument software for data acquisition in rubber industry.		**04**
Q. 5	**(b)**	Explain the procedure for factory personnel for incorporating the microcomputers in rubber laboratory.		**06**
		OR		
Q. 5	**(a)**	Answer the following		
	i	In proportional derivative controller, the error increased at the rate of 6ºC/minute. The proportional sensitivity is 4 and derivative time is 1. Plot the response of controller.		**04**
	ii	List the peripherals used in microcomputers.		**03**
Q. 5	**(b)**	Discuss the errors in microcomputer data acquisition and analysis.		**07**

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