Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–VIII • EXAMINATION – SUMMER 2014**

**Subject Code: 182604** **Date: 31-05-2014**

**Subject Name: Automation and Control in Rubber Industries**

**Time: 10.30 am - 01.30 pm** **Total Marks: 70**

## Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Write the answer to the points.**

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|---|---|---|---|
| **Q. 1** | **(a)** | Discuss the term instrumentation. Discuss in detail about the classification of instrument. | **07** |
| **Q. 1** | **(b)** | Answer the following | |
| | **i** | Which characteristic information would be indicated by instrumentation diagram? | **04** |
| | **ii** | Define the given terms: (i)Reproducibility (ii) Lag (iii) Hysteresis | **03** |
| **Q. 2** | **(a)** | Which methods are available for representation and optimization of process performance? Discuss them in detail with their advantages and limitations. | **07** |
| **Q. 2** | **(b)** | Answer the following | |
| | **i** | Write a short note on subcomponent specification. | **05** |
| | **ii** | Explain the term process control. | **02** |
| | | **OR** | |
| **Q. 2** | **(b)** | Answer the following | |
| | **i** | Differentiate the open loop control and close loop control. | **04** |
| | **ii** | Explain the term quality control. | **03** |
| **Q. 3** | **(a)** | Discuss in detail about pressure measurement using strain gauge pressure transducer. | **07** |
| **Q. 3** | **(b)** | Answer the following | |
| | **i** | How the barrel temperature measurement is carried out during the extrusion process? | **04** |
| | **ii** | Give the name of device which is used for speed measurement. Also give its classification. | **03** |
| | | **OR** | |
| **Q. 3** | **(a)** | Discuss in detail about various methods available for thickness measurement of extrudate. | **07** |
| **Q. 3** | **(b)** | Answer the following | |
| | **i** | Write a short note on thermistors. | **04** |
| | **ii** | Write in brief about the types of torque sensors used in rubber industry. | **03** |
| **Q. 4** | **(a)** | With necessary assumptions, derive the transfer function representing dynamic behavior of liquid level system. | **07** |

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| **Q. 4** | **(b)** | Answer the following | |
| | **i** | With the suitable example, explain the elements of controlled configurations. | **04** |
| | **ii** | A thermocouple produces an e.m.f in mV according to the temperature difference between the sensor tip $\theta_1$ and gauge head $\theta_2$ such that $e = \alpha*(\theta_1 - \theta_2) + \beta*(\theta_1^2 - \theta_2^2)$, $\alpha = 3.5*10^{-2}$ and $\beta = 8.2*10^{-6}$. The gauge head is at 20°C. The mV output is 12mV. Calculate the temperature at the sensor. | **03** |

**OR**

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|---|---|---|---|
| **Q. 4** | **(a)** | What do you mean by forcing function? Explain the different forcing functions used in the study of the transient response of first order control system and explain the response equation of any one forcing function with respect to first order system. | **07** |
| **Q. 4** | **(b)** | Answer the following | |
| | **i** | Thermometer having a time constant of 110 seconds is placed in a temperature bath. After thermometer reaches steady state temperature of 30°C, it is suddenly placed into hot fluid at 60°C. Sketch response of the thermometer. | **04** |
| | **ii** | Write in brief about the turnkey software. | **03** |
| **Q. 5** | **(a)** | Compare the hydraulic controller with pneumatic controller. | **07** |
| **Q. 5** | **(b)** | Answer the following | |
| | **i** | Derive the transfer function of Proportional Integral Derivative (PID)-controller. | **04** |
| | **ii** | Give the basic functions of automatic controller. | **03** |

**OR**

| | | | |
|---|---|---|---|
| **Q. 5** | **(a)** | Discuss the issues that affect calendered gauge and also explain the methods available to control the calendered gauge. | **07** |
| **Q. 5** | **(b)** | Answer the following | |
| | **i** | Write down the advantages and disadvantages of pneumatic controller over electronic controller. | **05** |
| | **ii** | Give the classification of process variables. | **02** |

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