

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE – SEMESTER VIII • EXAMINATION – WINTER - 2013****Subject code: 182604****Date: 13-05-2013****Subject Name: Automation and Control in Rubber Industries****Time: 10:30 pm to 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 procedure for analyzing a process and applying instrumentation. **07**
- Q.1 (b)** Answer the following
- i** Write a short note on dynamic characteristics of an instrument. **04**
  - ii** Explain the direct measurement and indirect measurement respectively. **03**
- Q.2 (a)** Discuss in detail about the simple two level factorial experimental design with suitable example. **07**
- Q.2 (b)** Answer the following
- i** Which general considerations are made for process capability studies? **04**
  - ii** Write brief note on material specifications. **03**
- OR**
- Q.2 (b)** Answer the following
- i** With suitable example of rubber processing equipment, explain the concept of open loop control. **04**
  - ii** Write brief note on product specification. **03**
- Q.3 (a)** List the various elastic pressure transducers. Discuss any two in detail. **07**
- Q.3 (b)** Answer the following
- i** Give the statement of Thomson effect. Write down the relationship between temperature and e.m.f. A thermocouple produces an e.m.f in mV according to temperature difference between the sensor tip  $t_1$  and  $t_2$ . Determine the mV output when the tip is at  $220^\circ\text{C}$  and gauge head is  $20^\circ\text{C}$ . Take  $\alpha = 3.5 \times 10^{-2}$  and  $\beta = 8.2 \times 10^{-6}$ . **04**
  - ii** Write a brief note on thermocouple lead wires. **03**
- OR**
- Q.3 (a)** Discuss in detail about the electric force transducers. **07**
- Q.3 (b)** Answer the following
- i** Write a short note on thermistors. **05**
  - ii** Which mechanical properties must be considered in selection of thermal well? **02**
- Q.4 (a)** Compare the hydraulic controller with pneumatic controller. **07**
- PTO.**
- Q.4 (b)** Answer the following
- i** A unit step change is given to PI controller. If the proportional sensitivity is **04**

4, integral time is 2, obtain the response of PI controller.

- ii Explain the positive feedback system and negative feedback system respectively. **03**

**OR**

**Q.4 (a)** Discuss in detail about the dynamic behavior of pneumatic control valve. **07**

**Q.4 (b)** Answer the following

i Derive the transfer function of PID controller. **04**

ii Define the following terms: (i) Process (ii) Measuring Element **03**  
(iii) Comparing Element

**Q.5 (a)** Give the advantages and disadvantages of post calendar thickness measurement. **06**

**Q.5 (b)** Answer the following

i How the data acquisition in rubber factory is carried out using turn key software? **06**

ii Give the importance of LANs to rubber factories. **02**

**OR**

**Q.5 (a)** Discuss in detail about the variety of sensors available for gum sheet measurements on calender rolls. **07**

**Q.5 (b)** Answer the following

i List the hardware steps necessary to bring information from rubber test sensor to microcomputer. **04**

ii Mention the different technologies used for thickness measurement in calendering. **03**

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