

**B.TECH. DEGREE EXAMINATION, MAY 2015****Seventh Semester**

Branch : Applied Electronics and Instrumentation

**PROCESS DYNAMICS AND CONTROL (A)**

(Old Scheme—Prior to 2010 Admissions)

[Supplementary]

Time : Three Hours

Maximum : 100 Marks

**Part A***Answer all questions.**Each question carries 4 marks.*

1. Distinguish between Interacting and Non-interacting systems.
2. Obtain the transfer function for N-identical non-interacting system in series.
3. A proportional pneumatic controller has  $A_1 = A_2 = 5 \text{ cm.}^2$ ,  $x_1 = 8 \text{ cm.}$  and  $x_2 = 5 \text{ cm.}$  The input and output pressure ranges are 3-15 Ps. Find the proportional band. The set point pressure is 8 PSi.
4. Compare advantages of pneumatic controllers over electronic controllers.
5. Name the various types of criteria used for evaluation of the response of the control system. Explain ITAE in detail.
6. Explain the damped oscillation method of process loop tuning.
7. Explain with diagram any one electrical actuators.
8. A pressure difference 1.1 PSi occurs across a constriction in a 5 cm. diameter pipe. The constriction constant is  $0.009 \text{ m.}^3/\text{sec. per Kpa}^{1/2}$ .  
Find (a) The flow rate in  $\text{m.}^3/\text{sec.}$  ; (b) The flow velocity in  $\text{m}/\text{sec.}$
9. Draw the diagram and explain the level control system through cascade flow control.
10. Discuss the advantages of feedword control system.

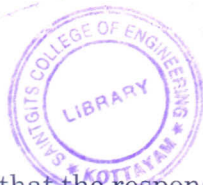
(10 × 4 = 40 marks)

**Part B***Answer all questions.**Each question carries 12 marks.*

11. A thermometer is observed to exhibit the first order dynamics is having time constant of 10 seconds and it is placed in bath. After the thermometer reaches steady state temperature of  $30^\circ \text{C.}$  with the bath, the temperature of the bath is linearly increased with time at a rate of  $6^\circ \text{C}/\text{min.}$  Sketch the response of the thermometer. Determine the dynamic error and time lag for the system.

Or

Turn over



12. Show that the response of Interacting system is more sluggish when compared to response of non-interacting system.
13. Describe the characteristics of two position and multiposition control modes.

*Or*

14. Explain in details the proportional derivative, proportional integral and proportional-integral derivative controllers.
15. (a) Explain the general guidelines for the selection of ISE, IAE and ITAE.  
(b) Describe the process reaction curve method with neat sketch.

(6 + 6 = 12 marks)

*Or*

16. (a) Write a note on Ziegler-Nichols optimum controller settings.  
(b) Define Bode stability criterion, phase and gain margins.
17. (a) Explain a hydraulic actuators with neat figure.  
(b) A force of 400 N must be applied to open a control valve. Find the diaphragm area if a control gauge pressure of 70 KPa must provide this force.

(8 + 4 = 12 marks)

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*Or*

18. Explain the working of pneumatic control valve with a neat figure. Write its transfer function.
19. (a) Explain the general features of a cascade process control system.  
(b) Discuss the feed forward control system for distillation column.

(6 + 6 = 12 marks)

*Or*

20. In a compound control system, the ratio between two variables is to be maintained at 3.5 to 1. If each has been converted to 0-5 volt range signal, devise a signal conditioning system that will output a zero signal to the controller when the ratio is correct.

[5 × 12 = 60 marks]