BITS, PILANI – DUBAI CAMPUS

Course No: EEE UC-417
Class: BE (Hons.)-IVYear (ELECTIVE)
Course Title: Computer Based Control System

TEST-I (Closed Book)

Date: October 24, 2004   Time: 50 Minutes   M.M. = 50

NOTE:

(i)   Answer all the questions.

(ii)   All questions to be answered in the answer sheet only.

(iii)   Question paper contains Two Pages.

(iv)   Answer all the parts of a question in continuation.

(v)   Do not leave any blank space/page(s) in between the answers.

(vi)   Do not write any thing on the question paper except your ID/hall ticket No.

(vii)   Cross the blank space/page (s), if any.

Q.1   (a)   When feed-forward control is preferred over feedback control system? Explain.   [4]

(b)   Figure-1 shows control operation of the distillation column in the presence of change in the feed flow rate. Implement the feed-forward control indicating clearly the function of the each component/block.   [6]
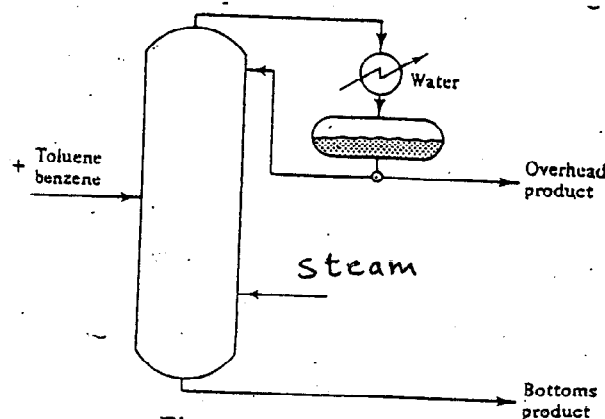

Figure – 1

Q.2 **(a)** What are the parameters, we take into account for control system to work satisfactorily in Process Industry? Explain in brief. [6]

(b) Draw the feedback control hardware blocks, required to control the temperature at set point 150^0C of a steam leaving a heat exchanger. Explain in brief the function of each block. Comments on the signal conditioning circuit required for the same. [9]

Q.3 Explain when: [12]
(a) Digital sensors are preferred over analog sensors
(b) Pneumatic system preferred over electronic system
(c) PI preferred over PD
(d) RTD preferred over Thermocouple

Q.4 **(a)** What are the process characteristics that affect the controller setting? Explain any three in brief in terms of electronic controller setting. [7]

(b) In fig.2 below the output of a Proportional controller at moderate Proportional Band (PB) is shown. Draw the response curve for wider PB and narrow PB. [6]
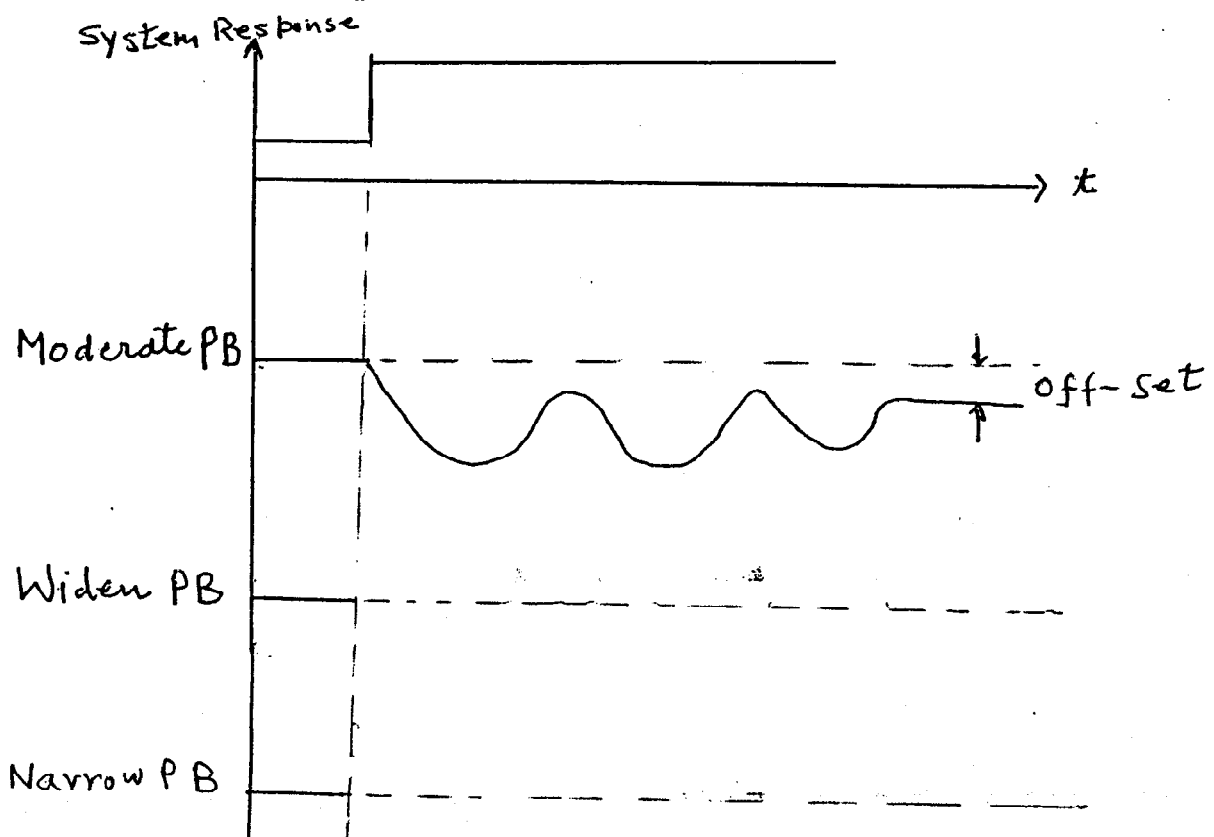

Fig.2

Course No: EEE UC-417
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TEST-II (Closed Book)

Date: December 12, 2004   **Time: 50 Minutes**   **M.M. = 30**

NOTE:

(i) Answer all the questions.

(ii) All questions to be answered in the answer sheet only.

(iii) Question paper contains Two Pages.

(iv) Answer all the parts of a question in continuation.

(v) Do not leave any blank space/page(s) in between the answers.

(vi) Do not write any thing on the question paper except your ID/hall ticket No.

(vii) Cross the blank space/page (s), if any.

Q.1 (a) Define DCS. What extra advantages we can take if we use DCS in place of PLC with SCADA system for a large process plant where ten thousands of parameter to be measured and controlled. **[6]**

     (b) What advantages or benefits we take from PLC being a Modular architecture? **[2]**

Q.2 (a) Names the different I/O module used in PLC/DCS. Indicate the basic function of I/O cards and comments on the signal transmission. **[4]**

     (b) Why we use PLC in place of electro-mechanical relay? Explain with full justification. **[4]**

Q.3 (a) Define the following terms and explain with example. **[6]**
       (i) Fuzzy set   (ii) Degree of membership
       (iii) Lingustic variable

(b) What parameter you take into account for sizing of control valve. [2]

Q.4 **(a)** Use the following blocks/circuits and draw a complete Direct Digital Control (DDC) system for interfacing to the process for data acquisition and control purposes. [3]
(i) Micro processor, (ii) Serial I/O ports (iii) Multiplexer
(iv) Sensor (v) Process (vi) Memory
(vii) DAC (viii) Timer (ix) clock
(x) actuator and Inter connecting buses

(b) Name & draw symbol of the control valve as shown in figure-1 (a). Indicate the purpose of stem as shown in figure-1 (b), (c) and (d). [3]
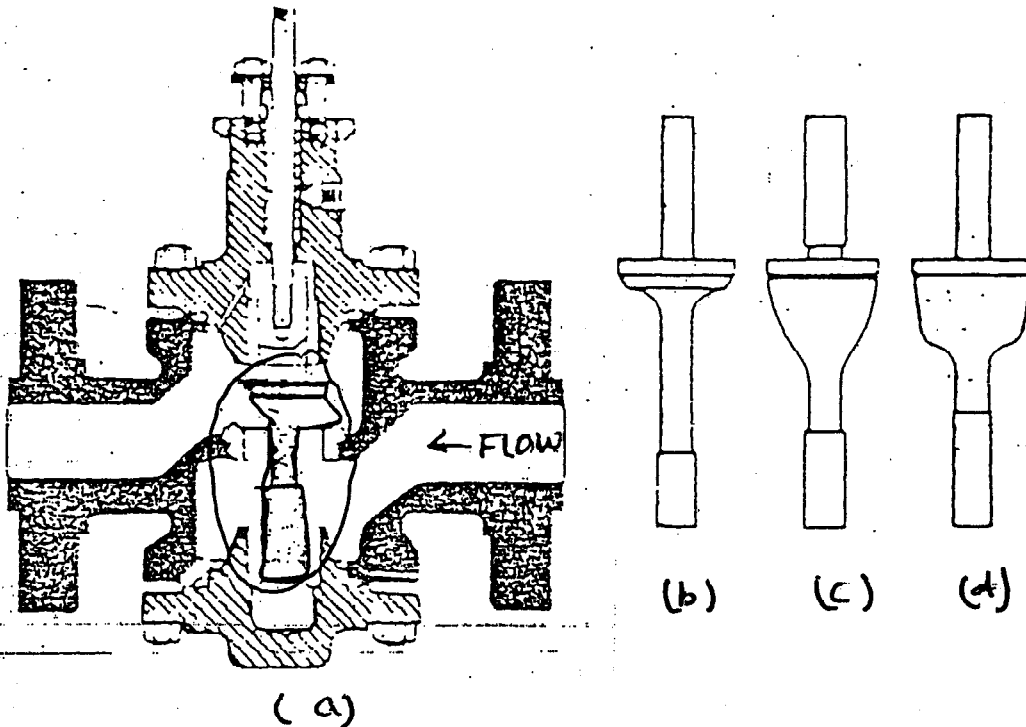

(a)

(b)   (c)   (d)

Figure-1 (a-d)

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COMPREHENSIVE EXAMINATION- (Closed Book)

Date: Jan. 10, 2005   **Duration: 3Hours**   **M.M. = 80**

NOTE:

(i)   Answer all the questions.

(ii)   All questions to be answered in the answer sheet only.

(iii) Question paper contains Three Pages.

(iv)   Answer all the parts of a question in continuation.

(v)   Do not leave any blank space/page(s) in between the answers.

(vi)   Do not write any thing on the question paper except your hall ticket No.

(vii) Cross the blank space/page (s), if any.

Q.1   (a)   Consider the heat exchanger shown in Figure-1 below.   **[7]**
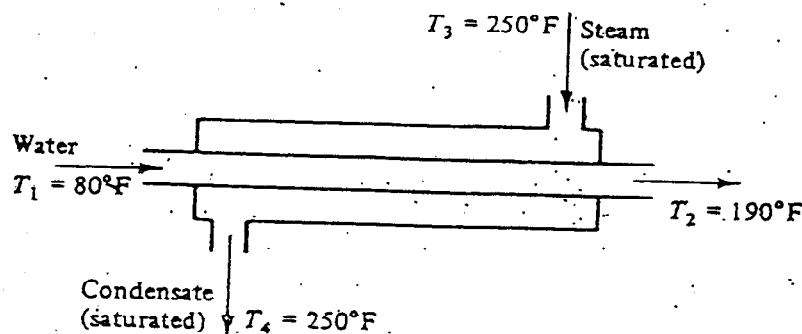

Figure-1

Identify:

(i)   Control objective for the system shown in Figure-1.

(ii)   All the external disturbances that will affect the operation of the heat exchanger.

(iii) All the available manipulated variables for the control of exchanger in the presence of disturbance.

(b) For the heat exchanger shown in Figure-1, Consider that the temperature $T_2 = 190^0F$ is our basic control objective (i.e. maintain this temperature in the presence of disturbance. Construct feedback and feed-forward control configurations that should satisfy the control objective in the presence of disturbances. **[6]**

(c) Why output of an electronic controller starts from 4mA not from zero? **[3]**

Q.2 (a) In a particular process if the pressure varies from 100-500psi and pressure drop is low. Which control valve you will suggest? Write the five main characteristics of that control valve. **[6]**

(b) Name the circuit shown in Figure-2. Indicate the name of the block/components as ~~indicated~~ marked in the Figure. ~~below~~. **[4]**
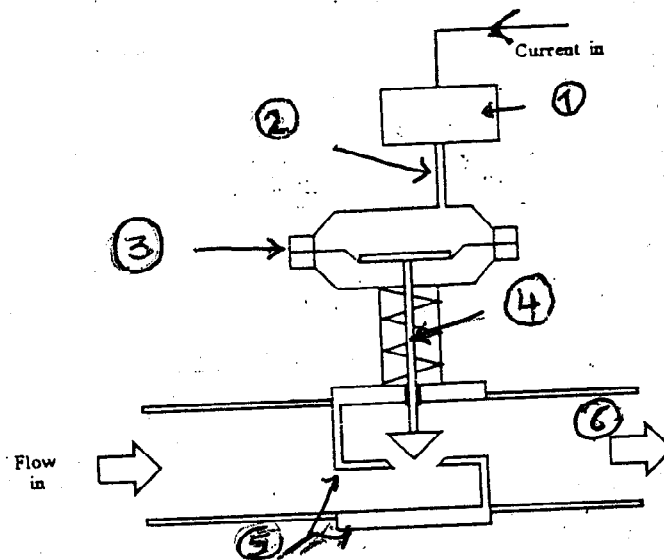

Figure-2

(c) Convert and write mathematical relationship between the following process signal conversion: **[6]**

    (i) 25% signal to pneumatic and electronics

    (ii) 12psig to percentage and electronics.

Q.3 (a) Define the scan rate and comments the scan rate of PLC and DCS. **[4]**

(b) What does SCADA means? Discuss it is software features in brief. **[6]**

(c) Draw and discuss the block diagram of real time structure of PLC with SCADA. **[6]**