Total No. of Questions : 12]

SEAT No. :

P875

[Total No. of Pages : 3

[4659]-332
B.E. (Instrumentation & Control)
PROCESS INSTRUMENTATION
(2008 Course) (Semester-I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from Section-I and 3 questions from Section-II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Clarify the following terms: **[8]**

i) Proportional Element.

ii) Degrees of freedom.

b) Differentiate clearly with suitable example multi capacity and single capacity process. **[8]**

OR

Q2) a) Explain in brief Dead time or transport delay processes. Discuss on controller design for deadtime dominant processes. **[8]**

b) Clarify the following terms: **[8]**

i) Self Regulating and Non Self Regulating Processes.

ii) Capacitance Element.

Q3) a) What is the need of analyzing process control loops? With the help of necessary diagrams and equations explain the procedure to test a typical Flow Control Loop. **[10]**

b) Explain in brief: **[8]**

i) Process gain

ii) Transmitter gain

iii) Valve gain

iv) Loop Gain

OR

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Q4) a) Apply Scaling & find out normalized (Scaled) equation for distillation column, following data is available: **[10]**

i) Internal reflux rate (L_i) = 0 to 15000 GPM

ii) External reflux rate (L) = 0 to 10000 GPM

iii) Temperature of overhead vapors (T_o):150–250°F

iv) External reflux temperature (T_r):125–225°F

v) ΔT max:50°F

vi) C_p:0.65 BTU/lb°F

vii) ΔH:250 BTU/hr

Equation for distillation column is $\frac{L_i}{L} = \left[1 + \frac{C_p}{\Delta H}(T_o - T_r)\right]$.

b) Compare SLPC and MLPC. **[8]**

Q5) a) Discuss in brief three goals to evaluate the control performance. **[8]**

b) Draw a schematic of feedback control system and describe the necessary components of feedback control system. **[8]**

OR

Q6) a) What do you mean by Fine Tuning? Explain with suitable example. **[8]**

b) Explain in brief purpose of Correlations for Tuning Constants. **[8]**

SECTION-II

Q7) a) What is Auctioneering control? Explain with suitable application. **[8]**

b) Explain in brief Limiters & Negative Resistance. **[8]**

OR

Q8) a) What is cascade control system? Comment on selection of final control element for particular application. **[8]**

b) Explain the working of a Feedforward control with suitable application. Explain in brief importance of adding Feedback to it. **[8]**

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Q9) a) Explain necessity of decoupling control. Determine RGA matrix for a system having process gain matrix, $K=\begin{bmatrix} 0.025 & -0.075 \\ 1 & 1 \end{bmatrix}$ **[8]**

b) Explain in brief procedure for calculating Relative Gain Array for 2 x 2 systems. List important properties of RGA. **[10]**

OR

Q10)a) In-line blending of two streams outlet flow F and composition X are to be controlled. The available manipulated variables are the inlet flow F1 with composition X1 & F2 with composition X2. The desired steady state for operational purposes is **[10]**

F = 200 moles/hr,

X = 60%

X1 = 80%

X2 = 20%

i) By using steady state mass balance, calculate the RGA.

ii) How would you pair the input-output variables for this process? Why?

b) Discuss in brief Influence of Interaction on Feedback Control. **[8]**

Q11)a) Explain with suitable block diagram "Internal Model Control". Also discuss design steps. **[8]**

b) Explain with suitable block schematic Self Tuning Controller. **[8]**

OR

Q12)Write short notes on any two: **[16]**

a) Fuzzy Logic Controller.

b) Dynamic Matrix Controller.

c) Back Propagation Algorithm.

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