Total No. of Questions :5] *[Total No. of Printed Pages :4*

Roll No .....

EI/IC - 702

B.E. VII Semester

Examination, December 2016

Process Control

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.
ii) All parts of each question are to be attempted at one place.
iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.
iv) Except numericals, Derivation, Design and Drawing etc.

1. a) List any four objectives of process control.
   b) Categorize the ways to obtain the mathematical modeling of higher order process.
   c) Generalize the list of control variables in heat exchanger and CSTR.
   d) Consider the system shown in figure below, develop a mathematical model for the system. Assume that the effluent stream from a tank is proportional to the hydrostatic liquid pressure that causes the flow of liquid. cross-sectional area of tank 1 is A_1 (ft^2) and of tank 2 is A_2 (ft^2). The flow rates F_1, F_2, F_3 are the ft^2/min. Take necessary assumptions.

OR

What are the main advantages and disadvantages of combining two controllers in series? For what kind of processes you will recommend this type of arrangement.

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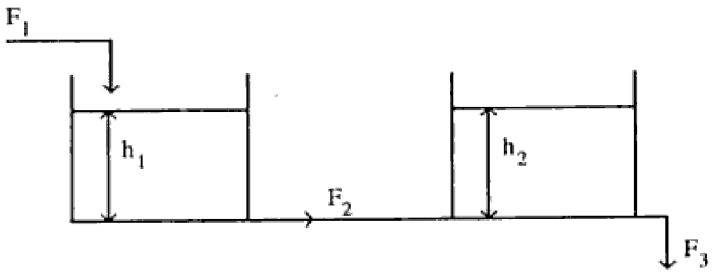

OR

Differentiate servo and regulatory operation with the help of suitable example. Explain with suitable examples, the difference between the interacting and non-interacting processes.

2. a) What are the drawbacks of feedback controller?
   b) What is the difference between ISE and IAE?
   c) Define neutral zone in ON-OFF controller.
   d) Describe the characteristics of ON-OFF, P, I×D controllers using suitable graphs.

OR

Describe cycling in the process output, in which control mode it occurs. Obtain the transfer function of PI controller.

3. a) Derivative controls can not be used alone justify.
   b) Define controller tuning.
   c) Give the criteria of selection of controllers.

   d) Design a PID controller using Root Locus method for the plant to satisfy the following specifications :

   Peak time = 0.5 s, Peak overshoot = 10% and steady state error = 10%

OR

Explain feed forward control with an example of distillation column.

4. a) Describe the function of an actuator.
   b) Define control valve sizing.
   c) Explain two advantages of using positioner in a control valve.
   d) Why equal percentage valve mostly used in process industries? Write down the flow equation of an equal percentage valve and sketch its inherent valve characteristics.

OR

Write short notes on :

i) Cavitation and flashing

ii) E-P converters

iii) Working of solenoid

5. a) Discuss PCI diagrams briefly.
   b) Describe selective control.
   c) Explain dead time compensation.
   d) Explain dynamic characteristics of a cascade control system. Explain it with an example. When do you recommend such a control system.