

B.E DEGREE EXAMINATIONS: APRIL/MAY 2011

Sixth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

U07EI603: Process Control

Time: Three Hours

Maximum Marks: 100

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. Degrees of freedom is given by
 - a) Number of variables-number of equations
 - b) Number of equations-Number of variables
 - c) Number of variables + number of equations
 - d) Number of equations*Number of variables
2. The problem related to maintaining the system state as close as possible to the desired state is _____
 - a) Minimum time problem
 - b) Regulator problem
 - c) Minimum Control effort problem
 - d) Servo Tracking problem
3. The term 'reset control' refers to
 - a) Integral control
 - b) Derivative Control
 - c) Proportional Control
 - d. None of the above
4. If stability error for step input and speed of response be the criteria for design the suitable controller will be
 - a) P controller
 - b) PI controller
 - c) PD controller
 - d) PID controller
5. A cascade control system has
 - a) A single loop
 - b) Loops within loop
 - c) A single controller
 - d) Overlapping loops
6. The controller which has one measurement and many manipulated variables is
 - a) Split range control
 - b) Cascade control
 - c) Ratio control
 - d) Inferential control
7. The type of valve used to handle slurries is -----
 - a) Needle valve
 - b) Butterfly valve
 - c) solenoid valve
 - d) Ball valve
8. Flashing occurs when
 - a) the valve outlet pressure is less than or equal to the pressure of the process liquid
 - b) the valve outlet pressure is more than the pressure of the process liquid
 - c) static pressure anywhere in the valve drops to or below the vapor pressure of the process fluid.
 - d) static pressure anywhere in the valve exceeds the vapor pressure of the process fluid.
9. Reflux ratio in distillation column is given by
 - a) flow of top product taken off/flow returned as reflux

- b) flow returned as reflux/ flow of top product taken off
 - c) flow of top product taken off * flow returned as reflux
 - d) flow of top product taken off + flow returned as reflux
10. The difference between the boiling point of a constant composition solution and the boiling point of pure water at the same pressure is termed as _____
- a) single-effect evaporation
 - b) multiple-effect evaporation
 - c) boiling point rise
 - d) capacity

PART B (10 x 2 = 20 Marks)

11. Distinguish between continuous process and batch process.
12. When a process is said to have inverse response?
13. What is meant by ITAE?
14. Write the equation for PID mode controller.
15. Draw the block diagram of feed forward controller.
16. Give any two applications of ratio control.
17. Draw the diagram of I/P converter.
18. What is meant by cavitation?
19. What is a reboiler?
20. Mention the types of Evaporators.

PART C (5 x 14 = 70 Marks)

21. a) Obtain the mathematical model of a stirred tank heater.
- (OR)**
- b) Find the transfer function $H_2(s) / Q(s)$ of the tanks shown in **fig 1**.
22. a) (i) Explain with neat sketch the ON-OFF controller with an example. (7)
- (ii) The error shown in **fig 2** is applied to a PID controller with $K_p=5$, $K_I= 0.7s^{-1}$, $K_D=0.5s$ and $P_I(0) = 20\%$. Draw a plot of the controller output. (7)
- (OR)**
- b) (i) Derive the transfer function of an electronic PI controller. (7)
- (ii) Discuss the Cohen and coon tuning method of controllers (7)
23. a) Write short notes on: (7+7)
- (i) Cascade control
 - (ii) Inferential controller
- (OR)**
- b) (i) Compare the advantages and drawbacks of feed forward and feedback controllers. (7)

(ii) With an example explain the concept of adaptive control. (7)

24. a) (i) Explain in detail about valve sizing. (9)

(ii) Find the proper valve flow coefficient for a valve that must pump gallons of ethyl alcohol per minute with a specific gravity of 0.8 at maximum pressure of 50 psi. (5)

(OR)

b) With neat sketch, explain the characteristics of valves.

25. a) Describe the working of distillation column with appropriate sketches.

(OR)

b) (i) Explain the principle, mechanism and uses of Mixing process. (7)

(ii) Explain the various control schemes for controlling exit temperature of fluid in heat exchangers. (7)

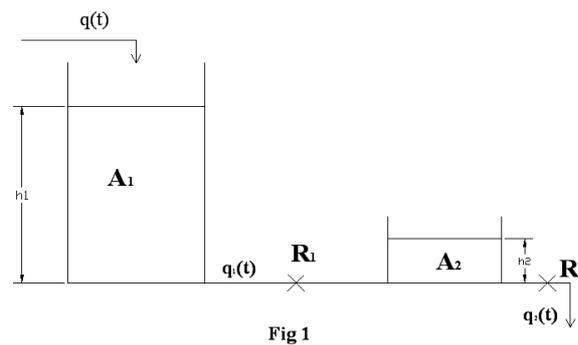


Fig 1

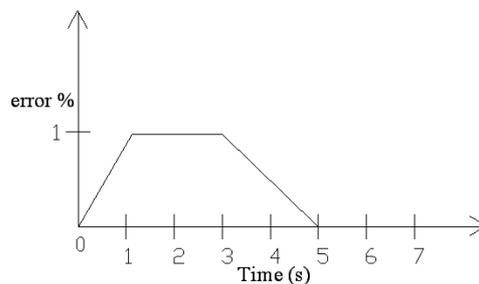


Fig 2