



Name :

Roll No. :

Invigilator's Signature :

CS / B.TECH (ICE) / SEM-6 / IC-601 / 2011

2011

PROCESS CONTROL

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) In feedback control
 - a) corrections are carried out before the disturbances affect the output
 - b) corrections are being carried out after the effect of disturbance is felt by the controlled variable
 - c) corrections are carried out at any time
 - d) none of these.



- ii) First order systems have
 - a) static sensitivity as characterizing parameter
 - b) static sensitivity & time constant as characterizing parameters
 - c) static sensitivity & damping factor as characterizing parameters
 - d) static sensitivity & natural frequency as characterizing parameters.
- iii) For a proportional controller
 - a) increase in proportional gain reduces offset but increases oscillations
 - b) increase in proportional gain increases offset
 - c) decrease in proportional gain reduces offset but increases oscillations
 - d) decrease in proportional gain increases offset but reduces oscillations.
- iv) Controller tuning refers to
 - a) best adjustment of controller parameters
 - b) best adjustment of steady state characteristics
 - c) best adjustment of response time
 - d) best adjustment of dynamic characteristics.

- [Turn over



- ix) For an integral process
 - a) output will continue to increase until limits of the system are reached
 - b) output will continue to decrease until limits of the system are reached
 - c) output will continue to increase irrespective of limit
 - d) output will remain constant.
- x) The objective of servo control is
 - a) elimination of disturbances
 - b) to make the controlled variable to follow the changes in set point
 - c) to make the controlled variable to follow the output
 - d) none of these.
- xi) Error resulting from the step change in set point is termed as
 - a) static error
 - b) offset error
 - c) dynamic error
 - d) disturbance.



- xii) Salient features of cascade control system are
- a) more than one measurement but one manipulated variable
 - b) one measurement but multiple manipulated variable
 - c) two feedback loops are nested together
 - d) both (a) and (c).

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

- 2. Differentiate between feedback & feed forward operations with the help of an example.
- 3. What is meant by self regulating system ? Explain. Give an example of self regulating system in hydraulic systems.
- 4. How is time proportional controller different from on-off controller ? Explain.
- 5.
 - a) What is meant by controller tuning ?
 - b) Define static error, offset error and velocity error.
- 6. Compare pneumatic controllers with hydraulic controllers in terms of speed, power output, safety & effect of temperature variation.



GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Explain the principles of operation of P, PI & PID controllers. Mention their positive & negative features.
- b) The transfer function of a 3-tank system in

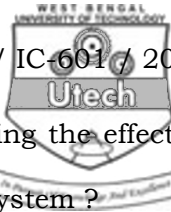
$$G_p(s) = \frac{6}{(2s+1)(4s+1)(6s+1)}.$$

The system is under proportional control. Find the value of K_p for which the closed loop system remain stable.

10 + 5

8. a) What are the advantages of cascade control configuration ?
- b) Explain 'end point control' configuration of ratio control with the help of an example.
- c) The temperature of a furnace is to be controlled. The rate of flow of fuel to the furnace is manipulated variable. Pressure of the fuel is the secondary variable. Draw a cascade control scheme for this system.

4 + 5 + 6



9. a) How does Schmitt trigger help in reducing the effect of noise on switching in a process control system ?
- b) How are P & I actions are realized in a pneumatic controller ? How are these actions varied in magnitude ? Obtain the transfer function of such a controller. 5 + 10
10. a) What is the C_v factor of a control valve ? How is it useful in valve selection & sizing ?
- b) When are single seated & double seated valves used ? List & compare their advantages & disadvantages.
- c) What is the difference between safety valve & relief valve ? 6 + 6 + 3
11. Write short notes on any *three* of the following : 3 × 5
- a) Dead time compensation
- b) Interacting & non-interacting processes
- c) Relation control
- d) Load disturbances and its effects.

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