



Name : .....

Roll No. : .....

Invigilator's Signature : .....

**CS/B.Tech (EIE)/SEM-6/EI-601/2012**  
**2012**  
**PROCESS CONTROL – I**

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 :  $10 \times 1 = 10$
- i) For 100% error to the proportional controller, its output is 50%. The proportional band ( PB ) is
- a) 200%                                      b) 150%
- c) 50%                                        d) 100%
- ii) The function of reset action is to
- a) reduce rise time
- b) reduce steady state error
- c) reduce oscillation in the response
- d) reduce overall gain.



iii) For a pneumatic controller, delayed negative feedback is equivalent to

- a) proportional control action
  - b) on-off control action
  - c) derivative control action
  - d) integral control action.
- iv) In a temperature control system process variable varies from  $40^{\circ}\text{C}$  to  $120^{\circ}\text{C}$ . What will be the value of controller output for  $60^{\circ}\text{C}$  ?

- a) 12 mA
  - b) 20 mA
  - c) 8 mA
  - d) 4 mA.
- v) Proportional gain is higher in
- a) Ziegler-Nichols method
  - b) Cohen-Coon method
  - c) Both of these
  - d) None of these.

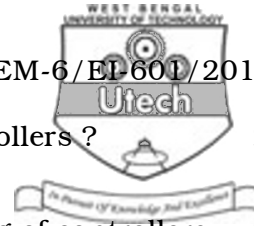


- vi) Process dynamics refers to
- a) Time varying behaviour of process
  - b) Static behaviour of process
  - c) Discrete behaviour of process
  - d) Impulse behaviour of process.
- vii) Flapper nozzle system uses
- a) hydraulic relay                      b) pneumatic relay
  - c) electrical relay                      d) mechanical relay.
- viii) Ratio control is a
- a) Feed forward control
  - b) Cascade control
  - c) Multivariable control
  - d) Both (a) & (c).
- ix) The hydraulic controller have
- a) very low inertia/torque ratio
  - b) very high inertia/torque ratio
  - c) very low power gain
  - d) none of these.

- GROUP – B**

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

- 6008



3. a) What do you mean by tuning of controllers ? 2
- b) Enlist the different methods for tuning of controllers. 2
- c) What is  $\frac{1}{4}$  decay ratio ? 1
4. What is the basic principle of cascade control ? Where and why is this type of control preferred ? 3 + 2
5. What is feedforward control and why is it so called ? State the reason of using feedback in this form of control. 3 + 2
6. What do you mean by double seated valve ? Why is it advantageous over single seated valve ? 3 + 2

### GROUP – C

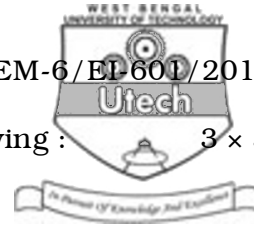
#### ( Long Answer Type Questions )

Answer any *three* of the following. 3 × 15 = 45

7. a) Explain the principle of operation of ON-OFF controller. 2
- b) What are the main components of digital control loop in a feedback process ? Explain an algorithm which is used in PID control tuning. 5 + 4
- c) Explain an I-P converter with its proper diagram. 4



8. a) Mention the sources of disturbances in process control studies. 4
- b) Explain the basic process control loop of a process control system with the help of block diagram. 5
- c) What is offset ? Why does it appear ? How is it eliminated ? 6
9. a) Mention the function of final control element in a process control loop. 2
- b) Draw a PI diagram of a typical flow control loop with control valve as the final control element. 3
- c) "Actuator power required for a single seated valve is greater than the double seated valve". Justify the statement with proper diagram. 3
- d) Define valve coefficient. 2
- e) Draw and explain the operation of a spring actuator valve with positioner. 5
10. a) Explain PI pneumatic controller with diagram. Why is  $D$  controller not used alone in process control ? 7
- b) Explain ratio controller with example. 5
- c) How flow can be controlled using turbine flow meter ? 3



11. Write short notes on any *three* of the following :  $3 \times 5$

- a) Combustion control in a boiler
  - b) Self regulation
  - c) Three element drum level control
  - d) Solenoid valve
  - e) Override-control
  - f) DDC.
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