

Code No: R05311003

R05**Set No. 2**

III B.Tech I Semester Examinations, November 2010

PROCESS CONTROL INSTRUMENTATION**Common to Instrumentation And Control Engineering, Electronics And Instrumentation Engineering****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Explain in detail, the realization of proportional-integral action with the aid of bellows, flapper-nozzle etc.
- (b) Draw a three mode electronic controller and derive the expression for the output voltage. [8+8]
2. (a) Write the process equation for the flow rate process shown below figure 5a. u_0, u_1 and u_2 are the upstream head, head after metering device and downstream head respectively.

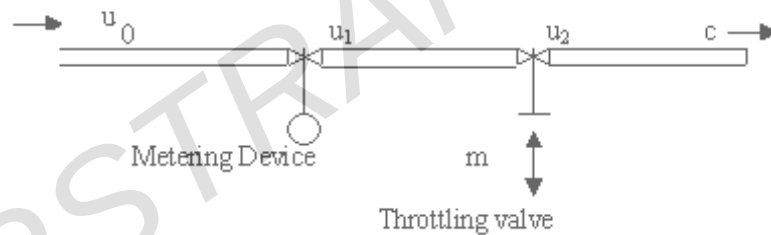


Figure 5a

- (b) Write the transfer function of the above flow rate process. [10+6]
3. Three identical tanks are operated in series in non-interacting fashion. For each tank, $R=1$ and $t = 1$. If the deviation in flow rate to the first tank is an impulse function of magnitude 2, determine
 - (a) An expression for $H(S)$ where H is the deviation in level in the third tank.
 - (b) Obtain the expression for $H(t)$.
 - (c) Sketch the response $H(t)$. [7+6+3]
4. (a) How do you select the controller for disturbance rejection and set point tracking.
- (b) Explain the practical aspects in the design of steady state dynamic feed forward controllers. [8+8]
5. (a) Give the principle of the control valve and give its O/P equation.
- (b) A pressure difference of 1.5 psi occurs across a constriction in a 4 cm diameter pipe. The constriction constant is $0.008 \text{ w}^3/\text{s}/(\text{kPa})^{1/2}$. Find
 - i. the flow rate in m^3/sec .
 - ii. flow velocity in m/sec . [8+8]

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6. Write steps followed in choosing a valve for better control of flow and should be cost effective. [16]
7. (a) Describe the following types of disturbances with relevant sketches.
- Transient
 - Set point changes
 - Load changes.
- (b) Write a short note on the following errors.
- IAE.
 - ISE .
 - ITAE.
- [8+8]
8. (a) Briefly discuss the characteristics of proportional control mode. Mention the type of processes for which proportional controller is most suited.
- (b) A proportional controller has a gain of 3. Plot the controller output for the error given below figure8b if $P_o = 50\%$. (P_o – controller output with no error) [8+8]

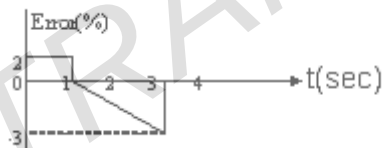


Figure 8b

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R05**Set No. 4**

III B.Tech I Semester Examinations, November 2010

PROCESS CONTROL INSTRUMENTATIONCommon to Instrumentation And Control Engineering, Electronics And
Instrumentation Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Briefly discuss the characteristics of proportional control mode. Mention the type of processes for which proportional controller is most suited.
- (b) A proportional controller has a gain of 3. Plot the controller output for the error given below figure 8b if $P_o = 50\%$. (P_o – controller output with no error) [8+8]

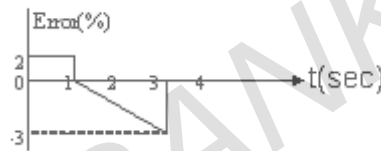


Figure 8b

2. (a) Give the principle of the control valve and give its O/P equation.
- (b) A pressure difference of 1.5 psi occurs across a constriction in a 4 cm diameter pipe. The constriction constant is $0.008 \text{ m}^3/\text{s}/(\text{kPa})^{1/2}$. Find
 - i. the flow rate in m^3/sec .
 - ii. flow velocity in m/sec . [8+8]
3. (a) Describe the following types of disturbances with relevant sketches.
 - i. Transient
 - ii. Set point changes
 - iii. Load changes.
- (b) Write a short note on the following errors.
 - i. IAE.
 - ii. ISE .
 - iii. ITAE. [8+8]
4. Three identical tanks are operated in series in non-interacting fashion. For each tank, $R=1$ and $t = 1$. If the deviation in flow rate to the first tank is an impulse function of magnitude 2, determine
 - (a) An expression for $H(S)$ where H is the deviation in level in the third tank.
 - (b) Obtain the expression for $H(t)$.
 - (c) Sketch the response $H(t)$. [7+6+3]

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5. (a) Write the process equation for the flow rate process shown below figure 5a. u_0, u_1 and u_2 are the upstream head, head after metering device and downstream head respectively.

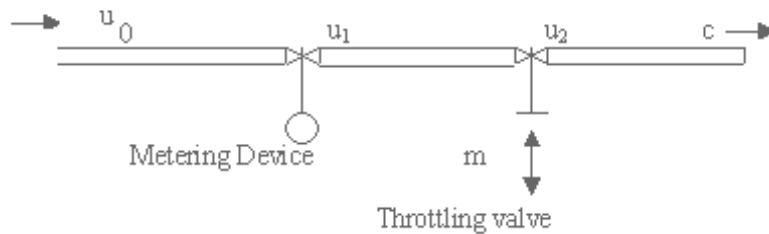


Figure 5a

- (b) Write the transfer function of the above flow rate process. [10+6]
6. (a) Explain in detail, the realization of proportional-integral action with the aid of bellows, flapper-nozzle etc.
- (b) Draw a three mode electronic controller and derive the expression for the output voltage. [8+8]
7. (a) How do you select the controller for disturbance rejection and set point tracking.
- (b) Explain the practical aspects in the design of steady state dynamic feed forward controllers. [8+8]
8. Write steps followed in choosing a valve for better control of flow and should be cost effective. [16]

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R05**Set No. 1**

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Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
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1. Write steps followed in choosing a valve for better control of flow and should be cost effective. [16]
2. (a) Give the principle of the control valve and give its O/P equation.
(b) A pressure difference of 1.5 psi occurs across a constriction in a 4 cm diameter pipe. The constriction constant is $0.008 \text{ w}^3/\text{s}/(\text{kPa})^{1/2}$. Find
 - i. the flow rate in m^3/sec .
 - ii. flow velocity in m/sec . [8+8]
3. (a) Write the process equation for the flow rate process shown below figure 5a. u_o, u_1 and u_2 are the upstream head, head after metering device and downstream head respectively.

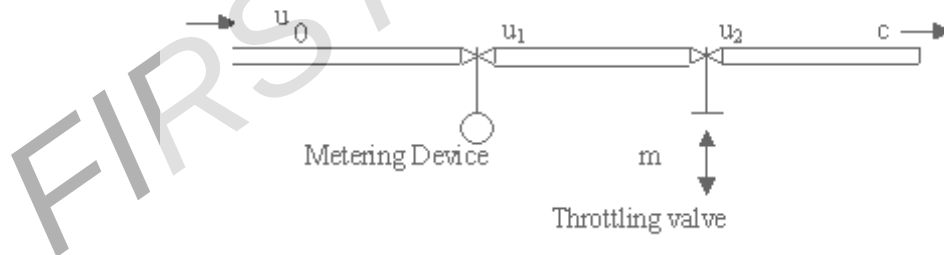


Figure 5a

- (b) Write the transfer function of the above flow rate process. [10+6]
4. (a) Describe the following types of disturbances with relevant sketches.
 - i. Transient
 - ii. Set point changes
 - iii. Load changes.
- (b) Write a short note on the following errors.
 - i. IAE.
 - ii. ISE .
 - iii. ITAE. [8+8]
5. Three identical tanks are operated in series in non-interacting fashion. For each tank, $R=1$ and $t = 1$. If the deviation in flow rate to the first tank is an impulse function of magnitude 2, determine

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- (a) An expression for $H(S)$ where H is the deviation in level in the third tank.
 (b) Obtain the expression for $H(t)$.
 (c) Sketch the response $H(t)$. [7+6+3]
6. (a) How do you select the controller for disturbance rejection and set point tracking.
 (b) Explain the practical aspects in the design of steady state dynamic feed forward controllers. [8+8]
7. (a) Briefly discuss the characteristics of proportional control mode. Mention the type of processes for which proportional controller is most suited.
 (b) A proportional controller has a gain of 3. Plot the controller output for the error given below figure 8b if $P_o = 50\%$. (P_o – controller output with no error) [8+8]

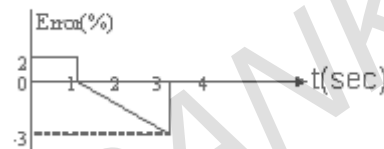


Figure 8b

8. (a) Explain in detail, the realization of proportional-integral action with the aid of bellows, flapper-nozzle etc.
 (b) Draw a three mode electronic controller and derive the expression for the output voltage. [8+8]

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R05**Set No. 3**

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PROCESS CONTROL INSTRUMENTATION**Common to Instrumentation And Control Engineering, Electronics And Instrumentation Engineering****Time: 3 hours****Max Marks: 80****Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Give the principle of the control valve and give its O/P equation.
(b) A pressure difference of 1.5 psi occurs across a constriction in a 4 cm diameter pipe. The constriction constant is $0.008 \text{ w}^3/\text{s}/(\text{kPa})^{1/2}$. Find
 - i. the flow rate in m^3/sec .
 - ii. flow velocity in m/sec . [8+8]
2. (a) Explain in detail, the realization of proportional-integral action with the aid of bellows, flapper-nozzle etc.
(b) Draw a three mode electronic controller and derive the expression for the output voltage. [8+8]
3. Write steps followed in choosing a valve for better control of flow and should be cost effective. [16]
4. (a) How do you select the controller for disturbance rejection and set point tracking.
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5. (a) Write the process equation for the flow rate process shown below figure 5a. u_0, u_1 and u_2 are the upstream head, head after metering device and downstream head respectively.

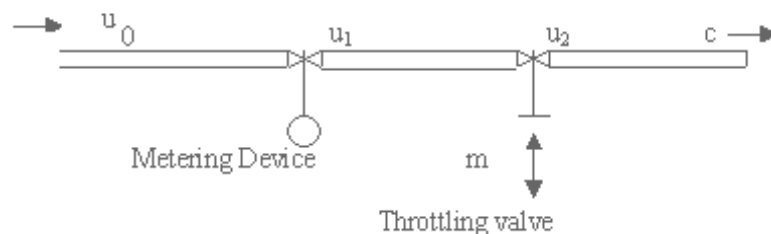


Figure 5a

- (b) Write the transfer function of the above flow rate process. [10+6]
6. (a) Describe the following types of disturbances with relevant sketches.
 - i. Transient
 - ii. Set point changes
 - iii. Load changes.

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(b) Write a short note on the following errors.

- i. IAE.
- ii. ISE .
- iii. ITAE.

[8+8]

7. Three identical tanks are operated in series in non-interacting fashion. For each tank, $R=1$ and $t = 1$. If the deviation in flow rate to the first tank is an impulse function of magnitude 2, determine

(a) An expression for $H(S)$ where H is the deviation in level in the third tank.

(b) Obtain the expression for $H(t)$.

(c) Sketch the response $H(t)$.

[7+6+3]

8. (a) Briefly discuss the characteristics of proportional control mode. Mention the type of processes for which proportional controller is most suited.

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[8+8]

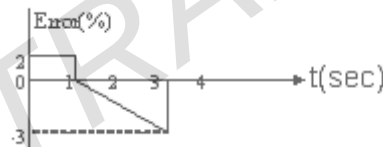


Figure 8b
