Code No: RR311304 **Set No. 1**

III B.Tech I Semester Regular Examinations, November 2006
PROCESS CONTROL
(Electronics & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Obtain the expression for the resistance and capacitance for thermal system.
   (b) Write the characteristics of liquid level system. [8+8]

2. (a) Briefly explain the control modes.
   (b) An integral controller is used for speed control with a set point of 15 rpm, range of 10 to 20 rpm. The integral constant K_I= -0.2% controller output per second per percentage error. The controller output is 28% initially. If the speed jumps to 17 rpm, calculate the controller output after 3sec for a constant error. [8+8]

3. A step change of magnitude 4 is introduced into a system having the transfer function of
   $\frac{X(S)}{Y(S)} = \frac{10}{S^2+1.6S+4}$

   Determine
   (a) Percentage of over shoot
   (b) Rise time
   (c) Maximum value of y(t)
   (d) Ultimate value of y(t)
   (e) Period of oscillations. [16]

4. How are proportional and integral actions realized in a pneumatic controller? Obtain the transfer function of such a controller. How do you adjust the integrating time of a PI Pneumatic controller? [16]

5. (a) Discuss about the advantages and disadvantages of feed forward control system.
   (b) Give an example for feed forward control scheme and explain it. [6+10]

6. (a) Write short notes on heat exchangers.
   (b) Implement control system for boiler drum level control. [8+8]

7. Briefly explain the principles governing the conduct of reactions in chemical process. [16]

8. Briefly write about the mass transfer operations. [16]

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Code No: RR311304 **Set No. 2**

III B.Tech I Semester Regular Examinations, November 2006
PROCESS CONTROL
(Electronics & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Obtain the expression for the resistance and capacitance for thermal system.
   (b) Write the characteristics of liquid level system. [8+8]
2. (a) Write about single speed floating control.
   (b) A proportional derivative controller has a sensitivity K_p= 1.0 and derivative time t_d= 1.0 min. If the deviation is sinusoidal, calculate the phase of oscillation of the manipulated variable. Prove that the phase lead depends upon derivative time. [8+8]
3. (a) Discuss about the selection of temperature sensors for various applications.
   (b) Briefly explain how a supply for pneumatic system is arranged. [8+8]
4. (a) Compare electronic controller with pneumatic controller.
   (b) Explain the principle of operation of hydraulic PD controller. [8+8]
5. (a) Draw a neat figure of pneumatic actuator with a positioner and explain. List its advantages.
   (b) Write a short notes on control valve sizing. [10+6]
6. Write briefly about boiler steam pressure ,drum level control Systems and super heat steam temperature control. [16]
7. Write short notes on the following.
   (a) Apportioning reactant flows.
   (b) Maximizing production. [8+8]
8. With suitable diagrams explain the operations involved in nuclear power plant.[16]

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Code No: RR311304 **Set No. 3**

III B.Tech I Semester Regular Examinations, November 2006
PROCESS CONTROL
(Electronics & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Give a process equation for any temperature type of process.
   (b) Explain what is meant by process load and process lag.
   (c) Compare the regulatory and servo operations. [8+4+4]

2. (a) Describe the o/p of a three-mode controller for an assumed error variation. Discuss its features.
   (b) A PD Controller has Kp =6, Kd =0.8 sec and P_0(controller output for zero error) = 15%. Plot the controller output as the function of time for the given error. as shown in the below figure2b [8+8]

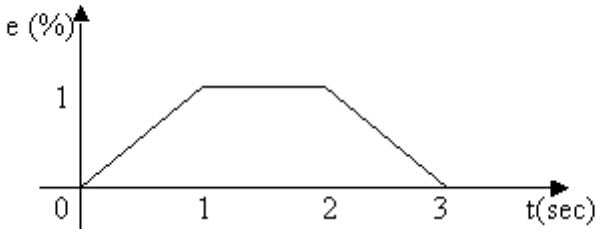

Figure 2b

3. Write a short notes on
   (a) Liquid − in − glass thermometers
   (b) Pressure thermometers
   (c) Peltier effect and Seebeck effect
   (d) Hall effect. [4+4+4+4]

4. (a) Outline the design steps involving in developing an electronic PI controller.
   (b) Design an electronic proportional controllers for (0 − 12 v) error input, 10% proportional band and 50% zero controller output. [8+8]

5. (a) Differentiate between direct action and reverse action final control operation.
   (b) Write about requirements of pressure drop across the valve for better control of flow. [8+8]

6. (a) Explain mass transfer operations.
   (b) Write about fuel and air flow ratio control in combustion system. [8+8]

7. (a) Discuss the stability of exothermic reactors.

(b) Write about the stability of endothermic reactors. [12+4]

8. Briefly write about the mass transfer operations. [16]

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Code No: RR311304 **Set No. 4**

III B.Tech I Semester Regular Examinations, November 2006
PROCESS CONTROL
(Electronics & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Write differential equation for the following single capacitance process,as shown in the below figure 1a

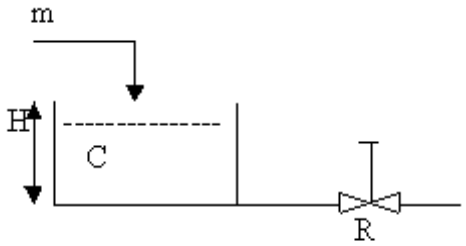

Figure 1a

(b) The above single capacitance level process has a normal operating head of 1.2 m and a normal valve of outflow of 3375 cubic cms /sec. The cross section area of the vessel is 0.54 m^2. If the resistance to the flow is parabolic, determine the time constant of the system.

(c) Show that the time constant of the above process is proportional to the time required to change the fluid in the vessel. [8+4+4]

2. (a) A PD controller has the following relationship for the proportional action only
Deviation = - 10 cm to + 10 cm
Manipulated variable (m) = 0 to 1 volt.
When the deviation changes at the rate of 6 cm/min, a voltage o/p of 0.025 v is added by the derivative action. If the deviation is sinusoidal with a frequency of 0.1 rad/sec. What is the phase of the manipulated variable?

(b) Explain the characteristics of a two-position controller. What is the need for a differential gap in such controller ? [8+8]

3. (a) Discuss about the selection of temperature sensors for various applications.

(b) Briefly explain how a supply for pneumatic system is arranged. [8+8]

4. (a) Discuss about working of pneumatic P + I controller with neat diagrams.

(b) Discuss about hydraulic integral controller with neat sketch. [8+8]

5. (a) A 4 to 20 mA control signal is loaded by a 100Ω resistor and must produce a 20 t0 40V motor drive signal. Find an equation relating the input current to the output voltage.

(b) Explain with an example the need of signal conditioning system in the final control operation. [8+8]

6. The temperature of condensate leaving a condenser is being controlled by manipulating the flow of cooling water. Assume heat transfer coefficient $U = KW_c$ $W_c \rightarrow$ cooling water flow. Derive the variation of heat transfer (Q) with W_c. What are the limitations of this approximation. [16]

7. Discuss the use of feed forward control for steam flow in an evaporator. [16]

8. With suitable diagrams explain the operations involved in nuclear power plant.[16]

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