Code :R7322304 1

III B.Tech II Semester(R07) Regular & Supplementary Examinations, April/May 2011
INSTRUMENTATION & BIO PROCESS CONTROL
(Biotechnology)

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

Answer any FIVE questions
All questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Discuss the characteristics of first order system for step forcing function in the input variable of the system.
2. (a) Define interacting and Non-interacting systems.
   (b) Derive the transfer function of an interacting system.
3. A Unit step change in error introduced into a PID controller. If K_C=10, T_I=1, and T_D=0.5, Plot the response of the controller. P(t).
4. Define controller tuning. Discuss about the criteria for good control.
5. What is process reaction curve? Explain its importance in controller tuning.
6. Explain the following:
   (a) Pneumatic actuators.
   (b) Ball valves.
7. Describe about "feed forward control".
8. Write short notes on the following:
   (a) Molecular wires & switches.
   (b) Semiconductor biosensors.

⋆ ⋆ ⋆ ⋆ ⋆

Code :R7322304 2

III B.Tech II Semester(R07) Regular & Supplementary Examinations, April/May 2011
INSTRUMENTATION & BIO PROCESS CONTROL
(Biotechnology)

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

Answer any FIVE questions
All questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. A thermometer having a time constant of 1 min is initially at 50^0C. it is immersed in a bath maintained at 100^0C at t=0. Determine the temperature reading at t=1.2 min.
2. (a) Derive the transfer function of a single liquid level system.
   (b) Derive the transfer function of an interacting system, $H_2(s)/Q(s)$.
3. Derive the transfer functions of different types of controllers.
4. (a) Discuss about the criteria for good control.
   (b) Explain about IAE, ISE, ITAE.
5. Describe about "Continuous & damped oscillation methods ".
6. Explain about "Control Valve characteristics".
7. Describe about "Ratio control" with a neat block diagram.
8. What are the different types of biosensors and discuss their applications.

⋆ ⋆ ⋆ ⋆ ⋆

Code :R7322304 **3**

III B.Tech II Semester(R07) Regular & Supplementary Examinations, April/May 2011
INSTRUMENTATION & BIO PROCESS CONTROL
(Biotechnology)

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

Answer any FIVE questions
All questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Discuss the dynamics of simple liquid level system and derive the transfer function H(s)/Q(s).
2. (a) Differentiate between SERVO and REGULATORY operation.
   (b) Derive the transfer function of a Non-interacting system, $H_2(s)/Q(s)$.
3. Describe the basic characteristics of three position controller.
4. Discuss about Ziegler-Nichols Controller settings.
5. (a) What is meant by process tuning and list the various methods of tuning of PID parameters.
   (b) Discuss process reaction method for control loop tuning.
6. Explain the principle of a direct and reverse pneumatic actuator.
7. Describe about "Cascade control" with a neat block diagram.
8. Write short notes on the following biosensors:
   (a) Bimolecular photomic computers.
   (b) Transducers in biosensors.

⋆ ⋆ ⋆ ⋆ ⋆

Code :R7322304 4

III B.Tech II Semester(R07) Regular & Supplementary Examinations, April/May 2011
INSTRUMENTATION & BIO PROCESS CONTROL
(Biotechnology)

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

Answer any FIVE questions
All questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. A thermometer having a time constant of 0.1 min is steady state temperature of 90^0F. At time t=0, the thermometer is placed in temperature bath maintained at 100^0F. Determine the time needed for the thermometer to read 98^0F.

2. (a) Explain about Continuous, batch process and self-regulation processes.
   (b) What is SERVO problem ? Give examples.

3. (a) A pneumatic P-controller is used to control temperature within the range of 60^0 to 100^0F. The controller is adjusted so that the output pressure goes from 3psi (fully open) to 15 psi (fully closed) as the measured temperature goes from 71 to 75^0F with the set point held constant. Find gain and proportional band
   (b) Write short notes on "on-off" Control.

4. Discuss the following:
   (a) $1/4^{th}$ Decay ratio
   (b) IAE
   (c) ISE
   (d) ITAE

5. Define process reaction curve ? Describe Cohen & coon controller tuning rules.

6. Discuss about different types of control valves and give their characteristics.

7. Explain multivariable control system by taking an example from distillation column.

8. Write short notes on "mechanical and molecular electronics based" biosensors.

⋆ ⋆ ⋆ ⋆ ⋆