BE/INST/Sem-VII (CBSGS)/Industrial Process Control/May-17

Q.P. Code : 635502

(3 Hours) **[Total Marks : 80**

N.B. : (1) Question No.**1** is **compulsory**.
(2) Answer any **three** questions from Question Nos. **2 to 6.**
(3) Assume suitable data if necessary.

1. Answer any **four** of the following questions:-
   (a) Discuss any one compressor control scheme. **5**
   (b) Draw the process flow sheet symbol for **5**
   (i) Distillation (ii) Dryer (iii) Crystallizer (iv) Boiler
   (c) Explain shrink and swell effect in relation to Boiler. **5**
   (d) Explain the drying rate curve. **5**
   (e) Explain with suitable example the use of safety interlocks in unit operation. **5**

2. (a) What is inferential measurement for top and bottom product composition control of distillation column. **10**
   (b) Discuss the use of baffles in heat exchanger unit with suitable diagram. Also draw and explain feed forward control scheme of H. E. **10**

3. (a) List out the raw materials required for Penicillin-G production. Draw process flow diagram and explain production process for Penicillin-G along with measurement and instrumentation. **10**
   (b) Explain the term 'runaway reaction'. Explain the cascade control with re-circulated cooling to control the temperature of reactor. **10**

4 (a) Explain the term, 'Boiler Combustion Efficiency'. Name the factors affecting efficiency and discuss Type-3 combustion control scheme. **10**
   (b) Show with graph, influence of degree of super saturation on nucleation and growth rate. With suitable diagram explain circulating magma crystallizer with indirect heat. **10**

5 (a) Explain the term Dryer. Draw and explain atmospheric tray dryer control scheme. **10**
   (b) Define intrinsic safety. Explain hazardous area classification as per IEC and NEC standards. **10**

6. Write comprehensive notes (any **two**) **20**
   (a) Control for fired reboiler
   (b) Vacuum Distillatieon operation and control requirement
   (c) 80/20 rule in intrinsic safety circuit design.

May 2017

B.E. Sem VII (CBSGS). (INST).
Biomedical Instrumentation

Q. P. Code : 812101

Duration: 03 Hours. Total marks: 80

N. B. (1) Question No. **1** is **compulsory**.
(2) Answer any **Three** out of remaining questions.
(3) Assumptions made should be **clearly** stated.

Q. 1 Solve any **Four** **20**

a) Explain EEG patterns

b) Explain action and resting potential of cell

c) Classify human nervous system.

d) What is Hounsfield number in C.T.?

Q. 2) a) Explain electrode electrolyte interface **10**

b) Explain cardio vascular system in detail **10**

Q. 3) a) Explain 12 lead electrode system for ECG measurement **10**

b) Explain electromagnetic blood flow measurement technique **10**

Q.4) a) What is cardiac output? Explain its measurement **10**

b) What is fibrillation? Explain D.C. defibrillatior **10**

Q. 5) a) Explain working of hemodialyser and precautions to be taken **10**

b) Explain working of X ray machine with block diagram **10**

Q.6) a) Explain modes of ultrasound imaging **10**

b) Explain physiological effects of electric current? **10**

T5227 / T1317 ADVANCED CONTROL SYSTEM

BE/ Sem VII / CBSGS / INST / ACS / May 2017

Q.P. Code : 798401

3 Hours **Total Marks :80**

Instructions: -

- Question **ONE** is compulsory
- Assume suitable data if necessary

Q1. Attempt any **Four** (20)

(a) Explain in detail Physical nonlinearity which has memory.

(b) Draw sinusoidal response of saturation with dead zone nonlinearity and write the response equation.

(c) Differentiate linear and nonlinear system in detail

(d) Comment on stability using singular stability.

$$\ddot{y} - 8\dot{y} + 17y = 34$$

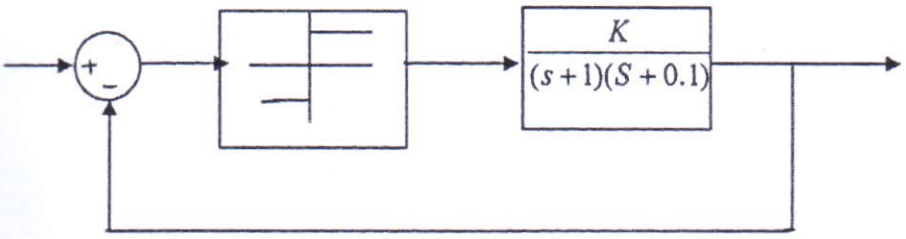
(e) Explain Lyapnov theorem in details.

Q2. (a) Comment on Stability of the state space model given below using suitable Lyapunov function. (10)

$$\dot{X}_1 = X_2$$

$$\dot{X}_2 = -X_1 - X_2$$

(b) Investigate Stability using Describing function of following system which has unity relay signal as a nonlinearity. (10)



Q3. (a) Determine Stability using Kresovski method. (10)

$$\dot{x}_1 = -x_1 - x_2^2$$

$$\dot{x}_2 = -x_2$$

(b) Design IMC controller for plant model $G(s) = \dfrac{(-s+1)}{(2s+1)}$ in order to achieve the response with time constant of 1.5 Sec. (10)

Q4. (a) Design the optimal controller via Riccati equation for system (10)

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ 2 & -1 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

To minimize the performance index $J = \int_0^\infty (x_1^2 + x_2^2 + u^2)dt$

(b) Draw Phase trajectory using delta method for given system. (10)

$$\ddot{x} + 5\dot{x} + 4x = 0$$

TURN OVER

Q.P. Code : 798401

Q5. (a) Derive the describing function for relay with dead zone (10)

(b) For the system described by, investigate variant gradient method to find Lyapnov's function For non linear system, (10)

$$\dot{x}_1 = -2x_2$$

$$\dot{x}_2 = -2x_2 + 2x_1x_2^2$$

Q 6. (a) Explain Jump resonance for nonlinear system (06)

(b) How to comment on stability using singular point. (08)

(c) Explain in details about limit cycle. (06)

Q.P. Code : 812200

(3 Hours) **[Total Marks: 80]**

N.B: (1) Question No. **1** is **compulsory**.
(2) Attempt any **Three** questions from remaining.
(3) **Figures** to the **right** indicate **full marks**.

1. Answer the following:- [20]
   (a) Explain continuous, discrete and mixed processes with examples.
   (b) Explain the functions of PLC I/O module.
   (c) Why HMI assumes a special significance in SCADA.
   (d) Explain functions of operator station and engineering station of DCS.

2. (a) Explain the PLC ladder diagram instructions - ON Timer, OFF Timer and Retentive timer. [10]
   (b) Write a ladder program for a bottle filling application for the given sequence- [10]
   i) When the START button is pressed the conveyor belt motor should be ON till a bottle is sensed.
   ii) The BOTTLE FULL switch senses if the bottle is empty and opens the valve V1.
   iii) The MOTOR starts again till next bottle is sensed.

   Inputs:-
   BOTTLE PRESENT switch- (NO)
   BOTTLE FULL switch- (NO)
   START Push button – (NO)
   STOP button – (NC)
   Outputs :- VALVE V1, MOTOR

   Draw I/O wiring diagrams, show memory calculations and ladder diagram.

3. (a) Explain the need for DCS integration with PLC and computer. Also explain the methods of integration. [10]
   (b) With a neat sketch explain how RTU communicates with the field and MTU in SCADA. [10]

4. (a) Explain how SIS is developed using safety life cycle approach. [10]
   (b) Explain ISA - S95 in connection with MES and ERP integration. [05]
   (c) What is the need for alarm management system? [05]

TURN OVER

5. (a) Compare PLC, DCS and SCADA on the basis of [10]
   i) Controllers ii) Processing capabilities iii) Data base
   iv) HMI/GUI v) applications
   (b) Explain with a neat diagram, evolution of DCS. [10]

6. Write Short note on: - [20]
   (a) Scan interval of SCADA system.
   (b) PLC memory organization.

QP Code : 812402

(3 Hours) **[Total Marks : 80**

N. B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **three** questions of the remaining questions.
(3) Assume any suitable data if required.

1. Attempt any **four** :– **20**
   (a) Explain the terms :
      (i) Sampling
      (ii) Quantization. What is the effect of smapling and quantization on the resolution of a digital image?
   (b) What do you mean by unitary matrix and orthogonal matrix?
   (c) What is histogram? State the difference between Histogram Equalisation and Histogram Matching.
   (d) State the five basic formulations for region based segmentation.
   (e) Differentiate between lossy and lossless compression.

2. (a) Explain following terms with example **10**
      (i) Digital Negative
      (ii) Gray level slicing
      (iii) Log Transformation
      (iv) Bit Plane Slicing
   (b) Explain discrete cosine transform and compute DCT for the given image **10**

F(x, y) =

2	1	2	1
1	2	3	2
2	3	4	3
1	2	3	2

3. (a) Apply following filters on the given image and show the intermediate results **10**
      (i) Low Pass Filter
      (ii) High Pass Filter
      (iii) Median Filter

4	3	7
1	6	3
1	4	6

   (b) Explain basic principles of detecting following in images **10**
      (i) Points
      (ii) Lines
      (iii) Edges. Generate 3 × 3 masks for each and explain operation

[TURN OVER

4. (a) Code the following data stream using Huffman coding **10**
   { 1,1,1,1,1,1,1,2,2,2,2,2,2,2,3,3,3,3,3,3,4,4,4,4,4,5,5,5,5,6,6,7}
   (b) Explain following morphological operations **10**
      (i) Dilation
      (ii) Erosion
      (iii) Opening
      (iv) Closing

5. (a) Calculate the distance measures for the given image **10**

p1	2	3	4
2	0	2	1
3	1	3	1
4	1	q0	2

      (i) Euclidean Distance
      (ii) City Block Distance
      (iii) Chess Board Distance
      (iv) m-adjacency Distance
   (b) Explain the basic concept of Haar Transform and state applications **10**

6. Write short notes on the following :– **20**
   (a) Homomorphic Filtering
   (b) Wiener Filter
   (c) High Boost Filter
   (d) Hougf Transform
