EE/INST/Sem-VII (CBSGS)/Industrial Process Control/
Nov-16

Q.P. Code : 635500

(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) Explain Crystallization curve and its significance. **5**
   (b) Discuss baffle flue pass for temperature control with respect to boilers. **5**
   (c) Explain bypass control in rotary compressor. **5**
   (d) Draw and explain hazard triangle. **5**
   (e) Discuss the control strategies for startup heater. **5**

2. (a) Draw and explain P & I for reaction crystallizer. **10**
   (b) Discuss the control scheme for tray dryer. **10**

3. (a) Draw the process flow diagram for refinery and explain FCCU. **10**
   (b) List the classifications of evaporator and derive its steady state model. **10**

4. (a) Explain the process of distillation and discus different packaging used in distillation column. **10**
   (b) With the help of diagram explain any three control strategies for heat exchanger. **10**

5 (a) Comment on objectives of combustion control system in Boiler and explain various types of control strategies. **10**
   (b) Explain different control parameters considered in Gas Turbine. **10**

6. (a) Explain cascade control scheme for reactor. **5**
   (b) Explain different sensors, analyzers and valves used in Iron and Steel industry. **10**
   (c) Discuss in detail IEC classification of Hazardous areas. **5**

BE / INST / Sem-VII (CBSGS) / Biomedical Instrumentation /
NOV-16

Q. P. Code : 812102

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 Nervous system

b) Explain origin of ECG, EMG and EEG.

c) What is Hounsfield Number in CT?

d) Compare direct and indirect blood pressure measurement

Q. 2) a) Explain types of bio potential electrode **10**

b) Explain rate responsive pacemaker with block diagram **10**

Q. 3) a) Explain EMG measurement with block diagram **10**

b) Explain ultrasonic blood flow measurement **10**

Q.4) a) Explain back projection image reconstruction technique in CT with suitable example **10**

b) Explain modes of ultrasound imaging **10**

Q. 5) a) Explain working of heart lung machine **10**

b) Explain working of artificial kidney and precautions to be taken **10**

Q.6) a)What is cardiac output? Explain its measurement **10**

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

BE/INST/Sem-VII (CBSGS)/Advanced Control System/Nov-16

Q.P. Code :798402

3 Hours **Total Marks :80**

Instructions: -

- Question one is compulsory
- Assume suitable data if necessary

Q1. Attempt any four (20)

a. Define nonlinear system and write detail classification of nonlinearities of system
b. Draw sinusoidal response of saturation with dead zone nonlinearity and write the response equation
c. Explain Jump resonance for nonlinear system
d. How to comment on stability using singular point.
e. Explain in details about limit cycle.

Q2. (a) For following system find of stability using singular point and draw trajectories. (10)

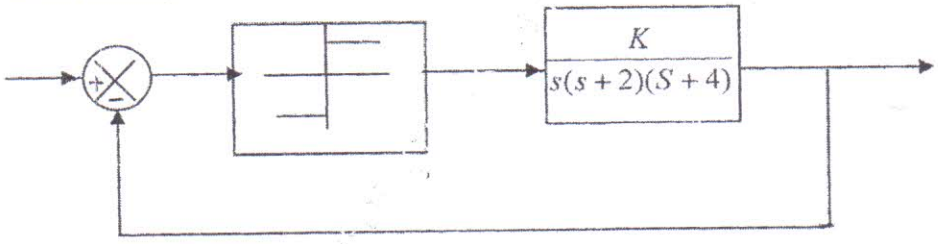
1. $\ddot{y} - 8\dot{y} + 17y = 34$
2. $\ddot{x} + \dot{x} + x^3 = 0$

(b) Derive the describing function for relay with saturation. (10)

Q3. (a) Comment on Stability of the state space model given below using suitable Lyapunov function (10)

$$\dot{X}_1 = X_2 - X_1(X_1^2 + X_2)^2$$
$$\dot{X}_2 = -X_1 - X_2(X_1^2 + X_2)$$

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



Q4. (a) Design IMC controller for plant model $G(s) = \frac{(-s+1)}{(2s+1)}$ to achieve the response with time constant of 1.5 Sec. (10)

(b) Design the optimal controller via Riccati equation for system

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

To minimize the performance index $J = \int_0^\infty (x_1^2 + x_2^2 + u^2)dt$ (10)

TURN OVER

Q5. (a) Determine stability using Krasovskii method (10)

$$x_1 = -x_1;$$

$$x_2 = x_1 - x_2$$

(b) Using variable gradient method find suitable Lyapunov function for the system given by (10)

$$x_1 = x_2$$

$$x_2 = -x_1^3 - x_2$$

Q6. (a) Explain in details IMC based PID controller Design/tuning. (10)

(b) Draw Phase Trajectory using delta method for given system, (10)

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

INST / Sem-VII (CBSGS) / Process Automation / NOV-16

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Q.P. Code : 812202

(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) Write a note on DCS flow sheet symbols.

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]

TURN OVER

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]

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

6. Write Short note on: -
   (a) Scan interval of SCADA system. [20]
   (b) Special purpose modules with respect to PLC.

INST/ sem-VII (CBSGS) / Image Processing / NOV-16

QP Code : 812401

(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. Answer the following (any **four**) :– **20**
   (a) Explain the slant transform. [10]
   (b) Explain 3 edge detector and describe them. [05]
   (c) Explain the following term [05]
      (i) Neighbours of a pixel
      (ii) Connectivity
      (iii) Adjacency
      (iv) Path
   (d) What are the differences between lossy and lossless compression. [10]
   (e) Distinguish between global, local and dynamic thresholdng. [10]

2. (a) Explain the Homomorphic filtering in image enhancement. **10**
   (b) Generate Huffman code for the given image space entropy, average code length and compression ratio. **10**

Levels	0	1	2	3	4	5	6	7
Probability	0.06	0.02	0.3	0.5	0.04	0.01	0.03	0.04

3. (a) Explain the following term with example **10**
      (i) Thresholding
      (ii) Gray level slicing
      (iii) Digital negative
      (iv) Contrast stretching
   (b) Explain discrete cosine transform and compute DCT for the given image **10**

F(x, y) =

4	2	1	2
1	0	2	0
2	1	0	2
1	2	4	3

[TURN OVER

4. (a) Name different types of image segmentation techniques and explain region merging and region growing technique with suitable example. **10**

(b) Apply the Histogram equlization on following **10**

Gray level	0	1	2	3	4	5	6	7
No. of pixel	800	1013	850	650	335	200	150	98

5. (a) Explain the basic block diagram of digital image processing. **10**

(b) Explain the properties of 2-D DFT. **10**

6. (a) Discuss the DPCM predictive coding and transform coding. **10**

(b) Explain Hough transform with a suitable example. **10**
