- Sem-VII - INST-(CBSGS) - Industrial Process Control

N-15

QP Code : 5866

(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.**
(4) Draw neat diagram with proper labeling.
(4) Figures on the right side indicate full marks.

1 Answer any **four**:-
(a) Explain one of the furnace control scheme with interlocks. 5
(b) Discuss the crystallization process with different regions. 5
(c) Explain the construction of 2:4 shell and tube H.E. 5
(d) Discuss design of hazard free industry. 5
(e) Explain the control parameters in gas turbine. 5

2 (a) Explain any two distillation column control strategies. 10
(b) Justify-three point drum level control nullifies the effect of bubbling. 5
(c) How economy is improved using bypass control scheme for H.E. 5

3 (a) What is Dryer? Explain atmospheric tray dryer control scheme with safety interlocks. 10
(b) What is necessity of selective control scheme for evaporator, explain with diagram. 10

4 (a) Define intrinsic safety and explain hazardous area classification as per IEC and NEC. 10
(b) Explain the process of Penicillin-G production along with control scheme. 10

5 (a) What are the methods of super saturation in crystallization? Explain construction and operation of circulation magma crystallizer. 10
(b) Explain the process flow diagram in iron and steel industry. 10

6 Write short notes (any TWO):- 20
(a) Temperature control scheme for reactor.
(b) Surge and its control techniques in compressor.
(c) Safety interlocks and burner management system.

Duration: 03 Hours. Total marks: 80

Instructions to the candidates if any:-

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 propagation of Action Potential

c) Explain origin of ECG, EMG, EEG and ERG.

d) What is Hounsfield Number in CT?

e) Compare direct and indirect blood pressure measurement

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

b) Explain measurement of respiratory parameters 10

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

b) Explain direct blood pressure measurement 10

Q.4) a) Explain origin of Heart sound? How it can be measured 10

b) What is pacemaker? Explain rate responsive pacemaker 10

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

b) Explain working of CT machine with block diagram 10

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

b) Explain physiological effects of electric current? 10

Sem- VII - (CBSGS) - INST - Advanced control System - Nov-15

QP Code : 5945

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

N.B.

1. Q.1 is ***compulsory***. Attempt ***any three*** from Q.2 to Q.6
2. Figures in ***right*** indicate ***full marks***.
3. Assume ***suitable data*** if necessary.

Q.1 Attempt ***any four*** **20**

(a) Define singular points of the system. How do you identify them in the phase portrait?

(b) Draw the sinusoidal response of saturation with dead zone nonlinearity. Write the response equations.

(c) Define positive definite matrix. What are the properties of the positive definite matrix if it is symmetric?

(d) Compute the 2-norm for the matrices

(i) $A=\begin{bmatrix}0 & 1\\ 3 & 5\end{bmatrix}$ (ii) $F=\begin{bmatrix}1 & 0\\ 0 & 5\end{bmatrix}$

(e) What are the limitations of plant inverse controllers ?

(f) Obtain the linear system matrix at the operating point $x_0^T=[1 \quad 0.5 \quad 0.5]$ for the system of equations.

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix}=\begin{bmatrix}x_2^2\\ x_3^2\\ -3x_1^2-11x_2^2-12x_3\end{bmatrix}$$

Comment whether the operating point is stable?

Q.2 (A) Draw the phase trajectory for the following system using delta method. Assume intial condition $x=1, \dot{x}=0$

$\ddot{x}+2\dot{x}+4x=0$ **10**

(B) Derive the describing function for relay with dead zone nonlinearity. **10**

Q.3 (A) Obtain via analytical method the solution of the following system and write the equation of trajectory. Assume initial condition $x_{10}=1, x_{20}=0$.

$\dot{x}_1=x_2$

$\dot{x}_2=-2x_1-3x_2$

What type of singular point the system will have? **10**

(B) Explain Lyapunov stability analysis with neat phase trajectories. **10**

BE- Sem - VII - (CBSGS) - INST - Process Automation - Nov-15.

QP Code : **6006**

(3 Hours) [Total Marks : 80

N.B. : (1) Question no. 1 is **compulsory**
(2) Attempt **any three** questions from the remaining **five** questions.
(3) Assume any suitable data of necessary.

1. Answer the following :- 20
   (a) Explain redundancy used in DCS. Justify the same
   (b) What is SIL? What are its levels and significance with process safety?
   (c) Give the specifications of PLC. Name its vendors.
   (d) SCADA is a real time system. Explain.

2. (a) What is automation? Give its significance. 5
   (b) Explain types of automation. 5
   (c) Explain the need of DCS integration with PLC. Also explain the methods of integration. 10

3. (a) Compare PLC, DCS and SCADA. 10
   (b) Prepare PLC ladder diagram for Stirred Tank Heater for the given sequence of process. 10
      (i) Fill the tank upto high limit.
      (ii) Heat and stir the liquid for 20 min.
      (iii) Empty the tank upto low limit.
      (iv) Repeat from step-1
   The hard ware has the following types of switches
      (i) Start PB in NO, STOP PB in NC
      (ii) NO type of limit Switches
   Draw GUI, do I/o listing and ladder diagram. Select remaining hardware that is necessary.

4. (a) Give different types of DCS displays. State significance of each type. 10
   (b) What is scan interval of SCADA? Give the factors that affect scan interval. 10

5. (a) Explain memory organization in PLC.
   (b) Explain general protocol structure used for communication between MTU and RTU of SCADA. Give an example.. 10 10

6. (a) What are protections layers? Explain their significance with reference to SIS. 10
   (b) What is MES? Explain MES and ERP integration. 10

MD-Con. 10769-15.

BE/INST/Sem-VII (CBSGS)/Image Processing -Nov-15

Q.P. Code : 6157

(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 with diagrams.
      (i) Neighbours of a pixel
      (ii) Connectivity
      (iii) Adjacency
      (iv) Path
   (b) Distinguish between global, local and dynamic thresholding.
   (c) Explain dilation and erosion operators with examples.
   (d) Explain run length encoding
   (e) Explain the Masks for point detection and line detection.
   (f) Explain the discrete light receptors over the surface of the retina of the Human age.

2. (a) With a neat block diagram explain the steps involved in a typical image processing system. 10
   (b) Explain the properties of 2D DFT. 10

3. (a) Apply the following filters on the following image and show the results. 10
      (i) Low pass filter (ii) High pass filter.

7	9	8	2	4
8	4	7	1	0
1	3	9	5	2
3	1	5	3	2

   (b) Explain Morphological operations : 10
      (i) Opening (ii) Closing
      (iii) Thinning (iv) Thickening.

TURN OVER

4. (a) Generate Huffman code for the given image source. Calculate entropy of the same and average length of the code generated. Also calculate the compression ratio achieved compared to standard binary encoding.

Levels	0	1	2	3	4	5	6	7
Probability	0.1	0.09	0.02	0.01	0.5	0.2	0.03	0.05

(b)

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

Equalize the above Histogram.

5. (a) Explain edge detection masks in images.
   (b) Explain euclidean distance, D4 distance, D8 distance and Dm distance.

6. Write short notes on :
   (a) Wiener filter
   (b) Haar Transform
   (c) Homoporphic filter
   (d) Region spliting and Region merging algorithms.
