Reg. No.												

Question Paper Code	12560

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024

Eighth Semester

Instrumentation and Control Engineering

20ICEL801 - COMPUTER CONTROL OF PROCESSES

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	What is State and state variable?	2	K1	CO1
2.	Define Complete state controllability.	2	K1	CO1
3.	Outline the procedure of system identification.	2	K2	CO2
4.	What is parametric method of system identification?	2	K1	CO2
5.	Demonstrate region of convergence (ROC).	2	K2	CO3
6.	What is IMC in control system?	2	K1	CO3
7.	Compare multiloop with multivariable PID controller.	2	K2	CO4
8.	List the applications of RGA.	2	K1	CO4
9.	Construct the block diagram of multivariable PID.	2	K2	CO5
10.	Identify any two challenges in the control of MIMO process.	2	K2	CO5

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

			Marks	K – Level	CO
11.	a)	Find the state transition matrix for the system matrix $A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$.	13	K3	CO1
		OR			
	b)	Determine the state controllability and observability for the following system. $\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \\ x_3(k+1) \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -3 & -2 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \\ x_3(k) \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(k).$ $y(k) = \begin{bmatrix} 3 & 4 & 1 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \\ x_3(k) \end{bmatrix}.$	13	K3	CO1
12.	a)	Explain the identifying First-Order-Dead-Time (FODT) model.	13	K2	CO2
		OR			
	b)	Derive and explain the steps of the Recursive least square estimation method.	13	K2	CO2

13. a) Determine the inverse Z transform of $F(z) = \frac{3z^2+2z+1}{z^2+3z+2}$. *13 K3 CO3*

OR

b) Design a Dahlin's controller algorithm for $G_P(s) = \frac{e^{-0.8s}}{0.6s+1}$ for T=0.4sec. *13 K3 CO3*

14. a) Derive and explain the nature of interaction between two control loops when a loop is open and another is closed and vice versa. *13 K2 CO4*

OR

b) Consider the following RGA for a process with following matrices. *13 K2 CO4*

$\lambda = \begin{bmatrix} 1 & 1 & -1 \\ 3 & 4 & 2 \\ -3 & 4 & 0 \end{bmatrix}$ How will you choose input output pairing.

15. a) With a neat sketch discuss the major components of fuzzy logic controller. *13 K2 CO5*

OR

b) Explain multivariable PID controller with a neat block diagram. *13 K2 CO5*

PART - C (1× 15 = 15 Marks)

16. a) Derive RGA for n input- n output system. *15 K2 CO4*

OR

b) Identification and Control of an Industrial Distillation Column: A Case Study approach. *15 K2 CO5*