

August/September 2022
B.Tech(EIC) Re-Appear VI SEMESTER
Industrial Process control (EIC-310)

Time: 3 Hours

Max. Marks::60

NOTE:

1. It is compulsory to answer all the questions (2 marks each) of Part -A in short.
2. Answer any four questions from Part -B in detail.
3. Different sub-parts of a question are to be attempted adjacent to each other.

PART-A (All the questions in this part are compulsory)

- Q.1(a) State the modelling objectives and the end use of the model. (2)
- Q.1(b) What are the classes that a control system has to satisfy? (2)
- Q.1(c) Define servo and regulator problems. (2)
- Q.1(d) Identify the two sources of instability in closed-loop responses. (2)
- Q.1(e) What is the effect of dead time in the response of a simple feedback control loops? (2)
- Q.1(f) Identify the functions and hardware components of a computer-process I/O interface. (2)
- Q.1(g) What is one-way decoupling of two control loops? (2)
- Q.1(h) What type of controllers would you use for the two controller loops of a cascade system? (2)
- Q.1(i) Draw three different feed-forward control configurations for the mixing process. (2)
- Q.1(j) What is Adaptive control and why is it needed in process control? (2)

PART-B (Attempt any FOUR questions)

- Q.2(a) Define the term "control configuration" and develop three different control configurations for the pH control problem of your choice. (5)
- Q.2(b) What is the requirement of mathematical modelling ? why it is so necessary? (5)
- Q.3(a) Why do most of process reaction curves have an over-damped, sigmoidal shape? Can you develop a physically meaningful system which has a reaction curve with an under-damped, oscillatory shape? (5)
- Q.3(b) What are the basic hardware components of feedback control loop? Identify the hardware elements present in a feedback loop for the temperature control of a stirred tank heater. (5)
- Q.4(a) What is the impact of model inaccuracies on the effectiveness of dead-time compensators? (5)
- Q.4(b) Explain first order lag system? Is it self-regulation type system? (5)
- Q.5(a) Consider a process with one controlled output and two active manipulated variables. Under what conditions could you use both manipulated variables to control single output? (5)
- Q.5(b) If, in addition to the unmeasured disturbance there are measured disturbances in a system, we can develop a combined inferential-feed forward configuration; develop such a configuration for a system of your choice. (5)
- Q.6 What are the properties of a relative-gain array? How to evaluate the elements of relative gain array , if on element is known? (10)
- Q.7 What size computers would you use for DDC and supervisory control? Why? How do the DDCs communicate with the supervising computer? (10)