

Duration: 03 Hrs.

Total Marks: 80

Note:

Q. No 1 is compulsory

Attempt any THREE questions from Q No 2 to Q No 6.

Q.1) Attempt Any Five

20 M

- Explain with an example split range control.
- Why Pneumatic instrumentation is preferred in processing plants?
- Explain Decay Ratio and its significance.
- Explain Proportional Band and Offset.
- Compare Self Tuning Regulator and MRAC
- A liquid level control system converts a displacement of 5m to 10m into a 4 to 20mA control signal. A relay serves as the two position controller to open or close an inlet valve. The relay closes at 12mA and opens at 10mA. Find neutral zone and displacement gap in metres.

Q. No 2)

- Explain with a neat sketch working of pneumatic PID controller. 10 M
- A PI Controller indicates an output of 12mA when the error is zero. The set point is suddenly increased to 14mA and the controller output is recorded and is as given below: 10 M

Time t, sec	0	10	20	30
Output in mA	14	16	18	20

Find Proportional gain and integral time.

Q.No 3)

- Explain why tuning is required. Explain Relay feedback approach of tuning. 10 M

b. Consider a process with the following input-output relationships

10 M

$$y_1 = \frac{1}{s+1} m_1 + \frac{1}{0.1s+1} m_2$$

$$y_2 = \frac{-0.2}{0.5s+1} m_1 + \frac{0.8}{s+1} m_2$$

Compute Relative Gain Array.

Q. No 4)

a. What is Dead Time? Derive equation for dead time and also give its approximate model. Why dead time systems are difficult to control?

10 M

b. Prove integral action eliminates offset introduced by proportional action in PI Controller. Consider a first order process, $G_m=G_f=1$, $G_d=0$.

10 M

Q. No 5)

a. Explain with suitable example both ratio control configurations.

10 M

b. Develop a ladder logic using physical ladder elements to maintain a neutral zone in a tank. Levels are measured using two level Switches LL(Low Level Switch) and LH (High Level Switch). Pump is made ON or OFF using this measurement. Truth Table is as given below: (bracket indicates actual status of switch)

10 M

LL Status	LH Status	Pump Status
Not Reached(0)	Not Reached(0)	Pump ON (1)
Reached (1)	Not Reached(0)	Pump ON (1)
Reached (1)	Reached (1)	Pump OFF (0)
Reached (1)	Not Reached(0)	Pump OFF (0)

System should start and stop only through two Push Buttons START(NO PB) and STOP(NC PB).

Q. No 6 Write Short Notes on (Any Four)

20 M

- Ziegler Nichol's Closed Loop Technique for tuning of controllers.
- Derivative controller and effect of PD Control on process.
- Interaction and Degrees of Freedom.
- Block diagram of MIMO system.
- Batch Process and its example.