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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

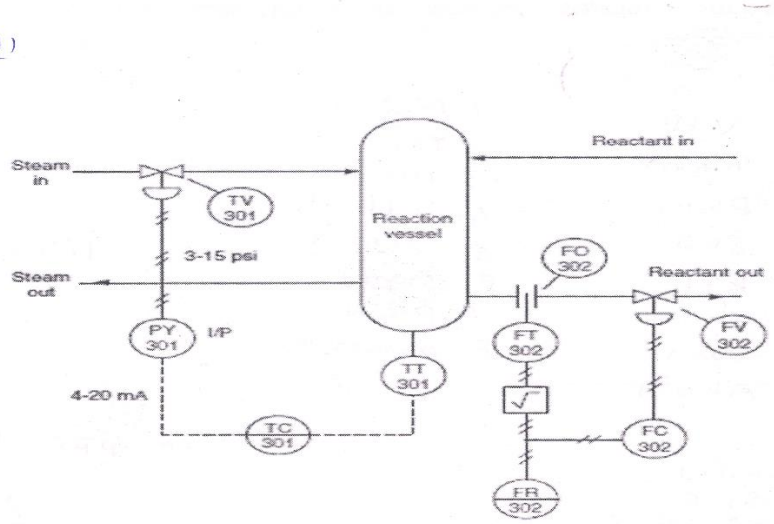
Programme: B.E. **Semester: V**
Branch: ELECTRONICS & INSTRUMENTATION ENGINEERING **Duration: 3 hrs.**
Course Code: 19EI5PCPCS **Max Marks: 100**
Course: PROCESS CONTROL SYSTEMS

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Identify various types of Manufacturing processes and differences between them. Also explain with one example each. **08**

b) Identify the various P& ID symbols and interconnecting lines indicated in the following diagram and explain its operation in detail. **06**



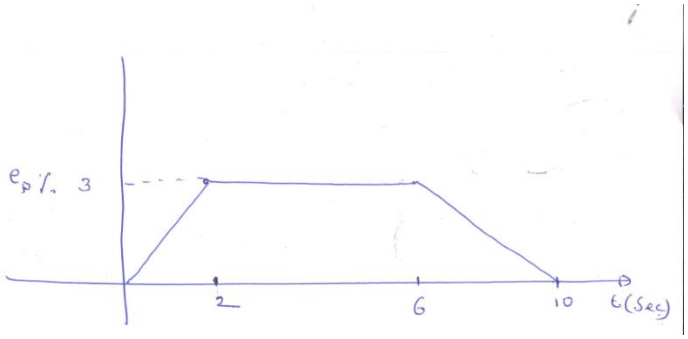
c) Classify various types of control valves and draw its characteristics. **06**

UNIT - II

2 a) Explain the five position controller with neat characteristic diagrams. **06**

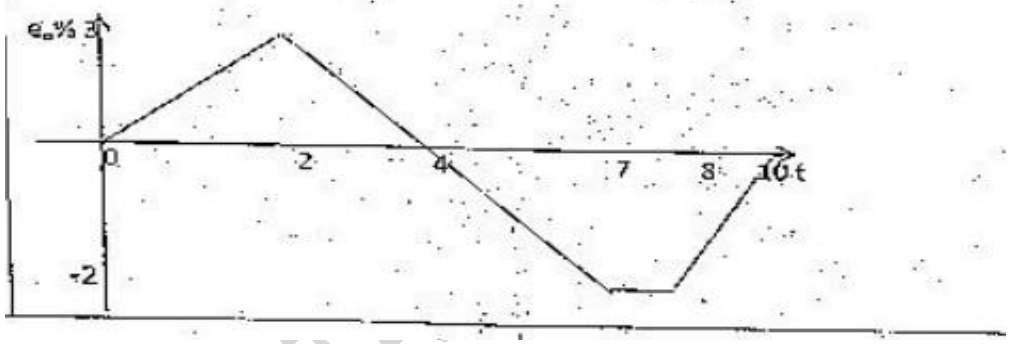
b) Consider a proportional controller with inlet valve is linear with a flow scale factor of $10m^3$/hr per percent controller output. The controller output is nominally 50% with a constant K_p = 10 % /% . A load change occurs when flow through the outlet valve B changes from 500 m^3/ hr to 600 m^3/hr. Calculate the new controller output and offset error. **06**

c) Give the error percentage curve plot the PI controller output for $K_p = 1.5$ and $K_I = 1.2\ sec^{-1}$ and $P_I(0) = 30\%$ **08**



OR

3 a) Plot the controller output of a P-I controller, $K_p = 1.2$, $K_I = 5sec^{-1}$ and sec and $P_I(o) = 30\%$ for the error curve shown in the figure below. **10**



b) Draw the necessary circuit diagram to implement a single speed controller using operational amplifiers and other basic components using 3 positional controller. **10**

UNIT - III

4 a) Design a two position controller for a level controller in a sump tank. The level measurement in a sump tank is provided by a transducer scaled as 0.2V/m. A pump is to be turned on by application of + 5V when the sump level exceeds 2 m. The pump is to be turned back off when the sump level drops to 0.1m. **10**

b) Draw the Pneumatic Proportional controller diagram and explain its working principle. **10**

OR

5 a) Design a PI controller with a proportional band of 30% and an integration gain of 0.1% / (%-sec) . The 4 to 20 mA input converts to a 0.4 to 2 V signal and the output is to be 0-10V. calculate the values of G_P, G_I, R_2, R_1 assuming Capacitance as 10 μF. **10**

b) Draw the Pneumatic PID Controller diagram and explain its working Principle. **10**

UNIT - IV

6	a)	Explain the process of open loop transient response method of tuning after drawing the process reaction curve.	**10**
	b)	Explain over ride control to protect a boiler system using the split range control with neat block diagram.	**10**

UNIT - V

7	a)	Explain dual redundant and triple redundant shut down systems and their architecture in detail.	**06**
	b)	Distinguish between safety, reliability and availability systems with respect to process instrumentation?	**09**
	c)	classify the hazardous area based on class/division system?	**05**

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