Total No. of Questions : 12]

SEAT No. :

P1983

[Total No. of Pages : 3

[5254] - 93
B.E. (Electronics) (Semester - II)
PROCESS AUTOMATION
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer 03 questions from Section I and 03 questions from Section II.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn whenever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain with suitable example process control block diagram. **[8]**

b) A sensor outputs a voltage ranging from -2.4V to -1.1V. For interface to analog to digital convertor, this need to be 0 to 2.5V. Develop the required signal conditioning. **[8]**

OR

Q2) a) Explain with suitable example following process characteristics : **[8]**

i) Process Equation

ii) Process Load

iii) Process lag

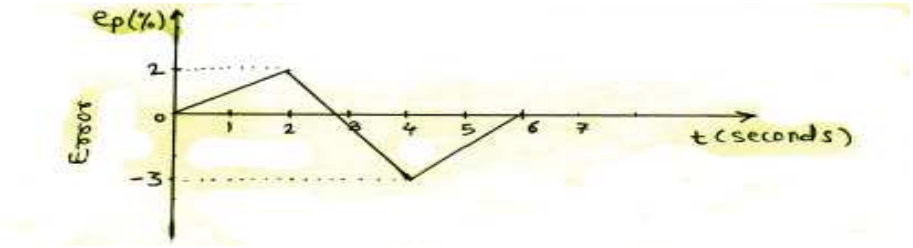
iv) Self Regulation

b) A pressure sensor outputs a voltage varying as 100mV/psi and has 2.5kΩ output impedance. Develop signal conditioning to provide 0 to 2.5V as pressure varies from 50 to 150psi. **[8]**

Q3) a) State the equation for a three mode PID controller. Explain with neat circuit diagram realization of this equation using operational amplifier. **[8]**

P.T.O.

b) A PID controller has Kp = 2, Ki = $2.2s^{-1}$, Kd = 2s and PI(0) = 40%. Solve the controller equations and plot the controller output for the error curve shown in figure. **[10]**



OR

Q4) a) Explain Ziegler Nichols method of process loop tuning. **[8]**

b) A temperature control system inputs the controlled variable as a range from 0 to 4V. The output is a heater requiring 0 to 8V. A PID controller is to be used with Kp = 2.4% /%, Ki = 9% (% -min), Kd = 0.7%/(%/min). The period of the fastest expected change is estimated to be 8 seconds. Develop the PID circuit. **[10]**

Q5) a) Sketch the following control valves. **[8]**

i) Globe Valve

ii) Butterfly Valve

iii) Diaphragm Valve

iv) Plug Valve

b) Find the proper valve size in inches for pumping a liquid flow rate of 600 ga/min with maximum pressure difference of 55psi. The liquid specific gravity is 1.3. Use the following control valve flow coefficient table. **[8]**

Valve Size inches	Cv
¼	0.3
½	3
1	14
1½	35
2	55
3	108
4	174
6	400
8	725

OR

Q6) a) Explain the terms flashing and cavitation with respect to control valves. **[8]**

b) An equal percentage valve has a maximum flow of 50 cm^3/s and a minimum of 2cm^3/s. If the full travel is 3cm, find the flow at a 1cm opening. **[8]**

SECTION - II

Q7) a) Explain feed forward control scheme for a steam heated heat exchanger. **[8]**

b) Explain with block diagram the concept of Model Reference Adaptive Controller (MRAC). **[8]**

OR

Q8) a) Explain with suitable example overriding control scheme to protect a process equipment. **[8]**

b) Explain with block diagram the concept of Model Based Controller (MBC). **[8]**

Q9) a) Draw and explain the P & I diagram for cascade control of a multiple effect evaporator. **[10]**

b) Draw and explain P & I diagram for three element control of drum level in a boiler. **[8]**

OR

Q10)a) Draw and explain P & I diagram for inferential control for top and bottoms product composition of a distillation column. **[10]**

b) Define a Robot. Explain how robots are classified. **[8]**

Q11)a) Explain with block diagram the architecture of a typical Distributed Control System (DCS). **[8]**

b) Write a short note on Square Root Extractor. **[8]**

OR

Q12)a) Explain with block diagram the architecture of a SCADA system. **[8]**

b) Explain with neat diagram a strip chart recorder. **[8]**

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