Ref No: EX/EE/5/T/514/2018(S)(OLD)

B. E. E. (EVENING) 5TH YR 1ST SEMESTER SUPPLE EXAMINATION, 2018

SUBJECT: - PROCESS INSTRUMENTATION AND CONTROL

Time: Three hours | Full Marks: 100 (50 marks for each part)

Use a separate Answer-Script for each part

PART I

Answer any **THREE** questions. Two marks are reserved for well organized answers.

1. a) Draw the instrumentation diagram for the following process: Flow rate in a liquid pipe line is controlled with a local electronic flow controller. The flow signal is obtained from a differential pressure transmitter and a square root extractor. The differential pressure is obtained from an orifice plate in the pipe line. 4+12

   b) Prove that in a digital controller $m_n' = k_p\left(1+\frac{\tau}{T_i}\right)e_n - k_p e_{n-1} + m_{n-1}'$

   where m_n is the controller output sequence and e_n is the error sequence. Show the input-output relation in block diagram form.

2. With a neat schematic diagram obtain the transfer function of a simple electronic analog PID controller using two OP-AMPS. 16

3. a) Discuss about the spring and diaphragm pneumatic actuator in reverse and direct acting modes. 9+7
   b) What are the basic designs available in rotary valves? List their advantages over conventional globe valves.

4. a) Draw the schematic diagram of a pneumatic PID controller and derive its transfer function.
   b) State advantage of pneumatic controllers over their electronic counterpart. 10+6

5. Write Short notes on any two: 8+8
   a) Self Regulating Process
   b) Equal Percentage Control Valves.
   c) Pneumatic Piston Actuator;

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B.ELECTRICAL ENGG. (EVENING) 5TH YEAR 1ST SEMESTER SUPPLE EXAM, 2018
(Supplementary)

SUBJECT: - PROCESS INSTRUMENTATION AND CONTROL

Time: Three hours

Full Marks 100
(50 marks for each part)

Use a separate Answer-Script for each part

No. of Questions	PART II	Marks
	Answer any three. ***Two marks reserved for neatness and well organized answers.***	
1.(a)	Derive the mathematical model of non interacting two tank system with linear resistance element.	8
(b)	Outflow (q_0) from a tank is equal to $2h^{3/2}$. Inflow is 'm'. Steady state level in tank is 4m, the area of the tank is $2m^2$. Find [H(s)/M(s)] and characterizing parameters of the transfer function.	8
2(a)	Describe the Process Reaction Curve (PRC) method for tuning of PID controller.	8
(b)	Using direct substitution method, find stability range of k_p for the system having transfer function as .	8
3(a).	Discuss the advantage of applying cascade control in jacketed CSTR.	8
(b)	Consider a closed loop system in which the process comprises of two first order systems connected in series with time constants 1min and ½ min, respectively. Measuring element is also a first order system with time constant of ½ min. Controller is of proportional mode with gain Kp. Draw the process control loop.	8
4.	Write short notes on the following. (i)Feed Forward Control (ii)Ratio Control	16
5.(a)	What is the difference between servo and regulatory system.	4
(b)	Derive the mathematical model of CSTH.	8
(c)	Discuss degree of freedom analysis in mathematical modeling.	4