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B.Tech.(EIE) (2011 & Onwards) (Sem.-5) PROCESS DYNAMICS AND CONTROL Subject Code : EI-305 Paper ID : [A0363]

Time: 3 Hrs.

Max. Marks : 60

INSTRUCTION TO CANDIDATES :

- 1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
- 3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

Q1. Answer briefly :

- a) Draw the symbols of electrical, pneumatic and hydraulic lines.
- b) Define static error, offset and velocity error.
- c) List different types of control valves used in process control.
- d) Write the operating range of pneumatic and hydraulic systems.
- e) Which IC is used for electronic controller, list its salient features?
- f) Draw the electrical equivalent of basic flapper nozzle system.
- g) Write and label the differential equation for second order process.
- h) What are the types of mathematical modeling?
- i) Write the equation for electronic PI controller.
- j) List the advantages of electronic controllers.



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SECTION-B

- Q2. List the different types of pneumatic actuators compare and contrast them and explain the pneumatic actuator with larger thrust force.
- Q3. Explain the mathematical modeling of thermal system.
- Q4. Compare and contrast of Proportional, Integral and derivative controller.
- Q5. Explain the proportional integral derivative (PID) control action with dead time.
- Q6. A 1.5 inch control valve has following specifications :

At 40 % value opening $C_v = 1.5$ At 30 % value opening $C_v = 0.9$

At 80 % valve opening $C_v = 9.25$

Calculate C_{ν} at 90% value opening where the control value has equal percentage characteristics.

SECTION-C

Q7. Consider the error voltage E_p is given by following relation.

 $E_p = t \%$ (0-1 sec) $E_p = l\%$. (1-3 sec) $E_p = (-1/2 t + 2.5) \%$ (3-5 Sec)

Find and draw the controller output with Kp =5, Ki = 0.5 S⁻¹, Kd = 0.5 s and P(0) = 50%.

- Q8. a) Explain the functioning of pneumatic proportional integral (PID) controller with suitable diagram.
 - b) Describe the construction and working of E-P Convert.
- Q9. Write short notes on following :
 - a) Tuning of controllers
 - b) Hydraulic actuator

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