

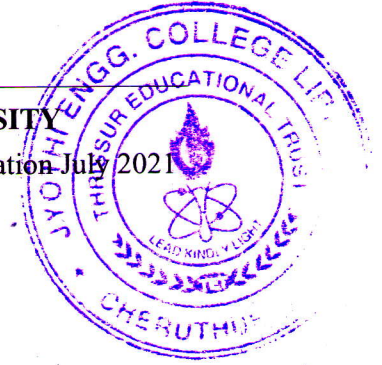
Reg No.: _____

Name: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree Regular and Supplementary Examination July 2021



Course Code: IC308

Course Name: PROCESS CONTROL INSTRUMENTATION

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- | | | |
|---|---|-----|
| 1 | a) Explain various types electric actuators used in process control applications. | (8) |
| | b) Explain the mechanism behind the working a direct and reverse acting pneumatic actuator. | (7) |
| 2 | a) How feedback and feedforward control actions can be used to suppressing the influence of external disturbances on the process. | (8) |
| | b) Analyse the effects of PI and PID control modes on the process. | (7) |
| 3 | a) Explain the concept of single speed floating control action and multiple speed floating control action. | (8) |
| | b) Explain the characteristics of two position mode and three position discontinuous controller modes. | (7) |

PART B

Answer any two full questions, each carries 15 marks.

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|---|---|-----|
| 4 | a) Using OP AMP circuits illustrates the methods implementing single modes of control action. | (7) |
| | b) With neat sketch, explain the working of P pneumatic controller. | (8) |
| 5 | a) Design a Proportional – Integral controller with a proportional band of 30% and an integration gain of 0.1 % / (% * sec). The 4 – 20 mA input converts to a 0.4 – 2 V signal, and the output is to be 0 -10 V. Calculate values of G_P , G_I , R_2 , R_1 and C respectively. | (7) |
| | b) A proportional –derivative controller has 0.4 to 2.0 V input measurement range, a 0 to 5 V output, $K_P = 5 \% / \%$ and $K_D = 0.08\% \text{ per } (\%/\text{min})$. The period of the fastest expected signal changes is 1.5 sec. Implement this controller with an op amp circuit. | (8) |

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- 6 a) With neat sketch, explain the working of P+I pneumatic controller. (7)
b) Draw and explain the electronic circuit for realizing the P, PI controller modes. (8)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Explain process reaction curve method and write cohen-coon feedback controller settings. (10)
b) Explain Zeigler- Nichols controller tuning method. (10)
- 8 a) With a neat block diagram explain Feedforward. (10)
b) With a neat block diagram explain Ratio control. (10)
- 9 a) Explain the cascade control strategy for a typical process with an example. (10)
b) Explain inferential control with neat diagram. (10)
