Reg. No.

A Constituent Institution of Manipal University

**MANIPAL INSTITUTE OF TECHNOLOGY** MANIPAL

FIRST SEMESTER M.TECH. (CONTROL SYSTEMS) END SEMESTER END EXAMINATIONS, DEC 2016/JAN 2017

SUBJECT: PROCESS DYNAMICS AND CONTROL [ICE 5121]

Time: 3 Hours

MAX. MARKS: 50

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## Instructions to Candidates:

- ✤ Answer ALL the questions.
- ✤ Missing data may be suitably assumed.
- 1A. Consider the transfer function of a first order lag system. Obtain its step response and 5 characterize the important features from the response. 3
- 1B. Define various elements and signals in a process control block diagram.
- 1C. Define process variable and manipulated variable.
- 2A. Derive a mathematical model for two tank interacting system. Comment on the step response of such a system.
- Explain any three commonly selected control configurations in process control. 2B.
- 2C. What are the significance of I/P and P/I converters in process control?
- 3A. A PID controller has K<sub>p</sub>=2.0, K<sub>l</sub>=2.2s<sup>-1</sup>, K<sub>D</sub>=2s and P<sub>l</sub>(0)=40%. Plot the controller output for the error shown in Fig. Q(3A).



## Fig. Q(3A)

- 3B. Illustrate the working of Proportional-Integral mode of composite control, with relevant error and controller output characteristics. Also specify its characteristics and 3 applications.
- 3C. With an example define self regulation and non-self regulation in process control.
- 4A. Explain reset windup phenomenon in process control with an example. Also write 4 about its effects and compensation.
- Illustrate the working of cascade control strategy in process control. 4B.
- 4C. Compare the advantages and disadvantages of feedback and feedforward control 2 strategy.
- 5A. Explain any one selective control strategy with suitable examples.
- 5B. What are the major advantages of model predictive control strategy?
- 5C. Give an account of control valve sizing.