Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

FIRST SEMESTER M.TECH (CONTROL SYSTEM) END SEMESTER EXAMINATIONS

NOV/DEC 2015

SUBJECT: PROCESS DYNAMICS AND CONTROL [ICE 521]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitably assumed.

1A.	Draw the schematic of a closed loop control system for a pressure control process. Also draw an alternate control loop for the same.	**5**
1B.	Explain the basic working of a CSTR with necessary sketch and also develop the mathematical model of a CSTR.	**5**
2A.	The temperature of water in a tank is controlled by a two-position controller. When the heater is *off* the temperature drops at 4 ^{0}K per minute. When the heater is *on* the temperature rises at 6 ^{0}K per minute. The setpoint is 323 K and the neutral zone is ±10% of the setpoint. There is a 0.2-min lag at both the *on* and *off* switch points. Find the period of oscillation and plot the water temperature versus time.	**4**
2B.	Write a note on floating control mode.	**3**
2C.	What is the necessity of using feedforward control system? Explain with example.	**3**
3A.	Derive the transfer function for offset of a proportional control mode in servo control mode for the closed loop system. Make necessary assumptions.	**4**
3B.	Given the error of Figure 3(b), plot a graph of a proportional-derivative controller output as a function of time.	**6**
4A.	Explain Ziegler Nichols open and closed loop tuning method with necessary equations.	**3**
4B.	Write a note on the effect of controller output with increase in Kp, Ki and Kd values with appropriate graphs.	**3**
4C.	Derivative control action with a gain of K_D = 0.1% /(%/min) is needed to control flow through a pipe. The flow surges with a minimum period of 2 s. The input signal has a range of 0.4 to 2.0 V, and the output varies from 0.0 to 5.0 V. Develop the op amp derivative action circuit.	**4**
5A.	What do you understand from time-integral performance criteria? Explain the types and compare the performance of each type with a graph.	**3**
5B.	With necessary equations explain cascade control. Design a cascade control system for a typical temperature process.	**4**
5C.	Explain the selective control strategy with an example.	**3**
6A.	Draw the architecture of supervisory controller and explain the function of each block.	**4**
6B.	Explain the working of a hydraulic actuator with directional control valve with	**4**

necessary sketch.

6C. What is position form of PID algorithm? Explain. **2**

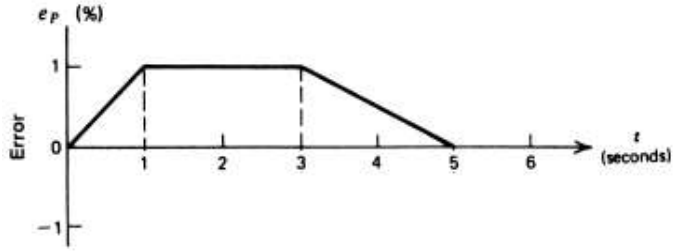

Figure 3(b)

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