Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH. (CHEMICAL ENGINEERING)

MAKE UP EXAMINATIONS, JUNE 2018

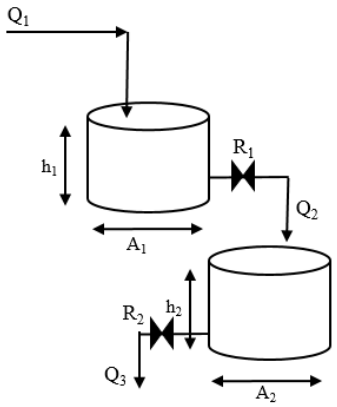
SUBJECT: PROCESS DYNAMICS AND CONTROL [CHE3203]

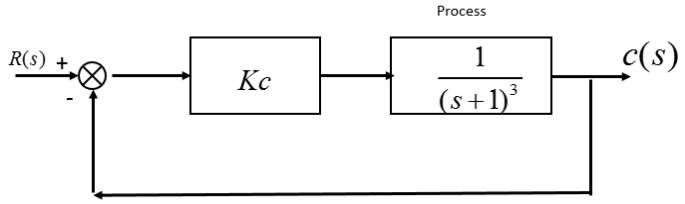
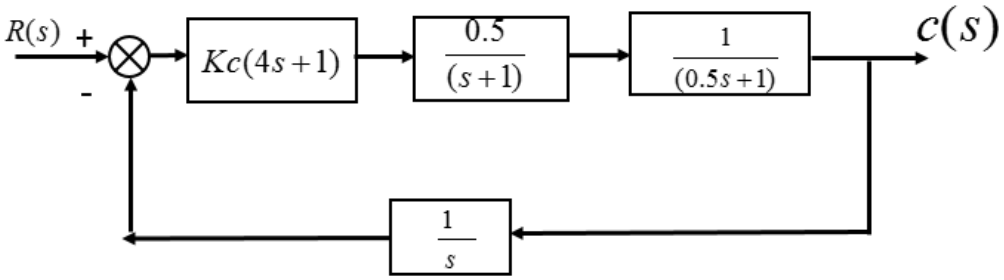
REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** questions.
- Use of linear graph sheet is permitted.
- Missing data may be suitably assumed.

1A	Explain the different variables used to describe the process to design a feedback control scheme.	**02**
1B	Define the Initial value and Final value theorems and discuss their importance in control system.	**04**
1C	Consider the Laplace transform of the function x(t) as, $$\bar{x}(s) = \frac{s^2 - s - 6}{(s-1)(s+1)(s-2)}$$ Find its x(t) using inverse Laplace transform.	**04**
2A	A thermometer assumed to first order dynamics with a time constant of 1 min is placed in a temperature bath at 100 ^{0}C. After the thermometer reaches steady state, it is suddenly placed in a bath at 110 ^{0}C at t = 0 and left there for 1 min, after which it is immediately returned to the bath at 100 ^{0}C. Calculate the thermometer reading at t = 0.5 min and at t = 2.0 min.	**06**
2B	Explain the characteristics of time delay system. Specify the transfer function model of time delay system and approximate with Pade's first order approximation	**04**
3A	Define the bounded and unbounded inputs. State their time-domain and S-domain forms	**04**
3B	Consider the storage tanks conneted in non-interacting way as shown below. Develop a transfer function model relating between liquid level (h_2) in the Tank-2 and the inlet flow rate (q_1). Assume that the density of the fluid remain constant and flow-head relationship consider to be linear. 	**06**

4A	Obtain the closed loop transfer function for servo and disturbance rejection problems and comment on the stability of the two problems.	**04**
4B	It is decided to design a P-controller for process which behaves as first order dynamics. The final control element and measuring elements follow unity gain responses. Prove that offset does exist for this control scheme.	**03**
4C	Determine the range of controller gain for the control system shown below using Routh-Hurwitz method. 	**03**
5A	A proportional derivative controller is used to control two first order system connected in series as shown below. Construct the root locus diagram for the control system and find the range of K_C for which the control system is stable. 	**04**
5B	a. Explain the Bode's stability criteria b. Discuss the gain margin and phase margin	**03**
5C	Discuss the working principle of different adaptive control schemes.	**03**

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