COLLEGE OF ENGINEERING & TECHNOLOGY

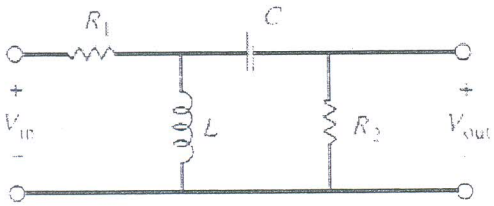
Department : Electrical & Computer Control Engineering
Lecturer : Staff Group
Course : Automatic Control Systems
Course Code: EE418 **Marks : 40**
Date : 10 /1/ 2016 **Time : 2 hours**

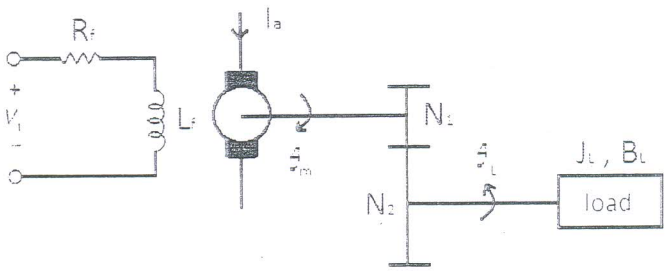
ANSWER FOUR QUESTIONS ONLY:

Question 1: (10 marks)

Obtain the transfer function for one of the following models (A or B)

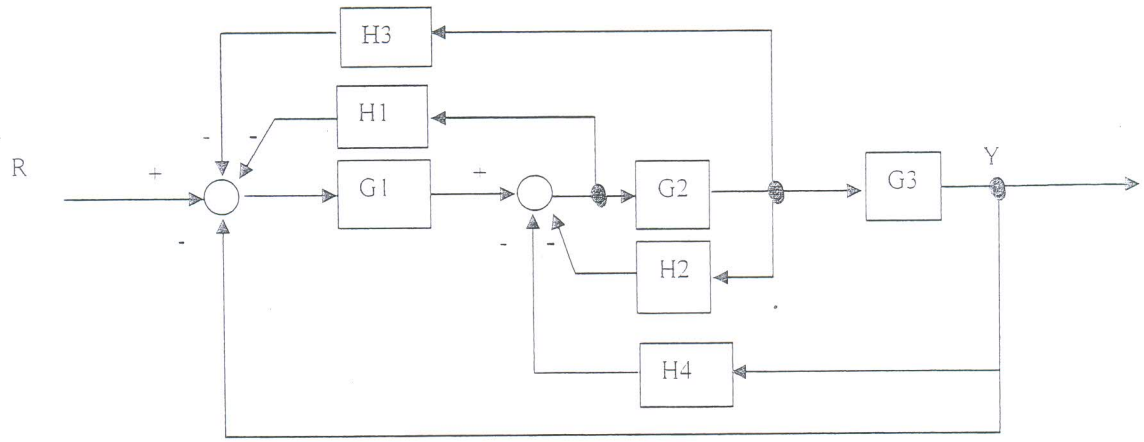
(A) $G(s) = V_{out}(s)/V_{in}(s)$. (B) $G(s) = \emptyset_L(s)/V_i(s)$.





Question 2: (10 marks)

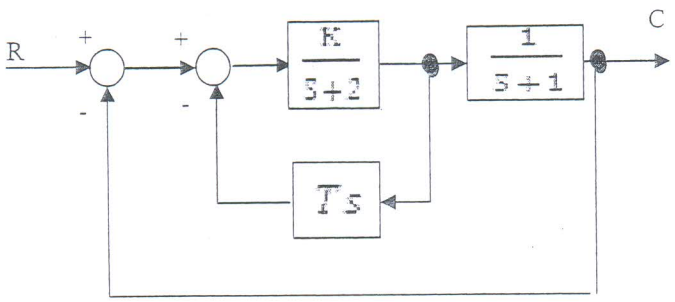
Find the overall transfer function T(s)=Y(s)/R(s) using block diagram reduction



Members of course Examination Committee:	Signature:	Date:
Lecturer: Staff		24/1/2016
Course Coordinator : Dr. Ahmed El-Shenawy		24/1/2016
Head of Department: Prof Hamdy Ashour		24/1/2016

Question 3: (10 marks)

For unit step input the control system shown below,



- Determine the values of K and T such that the closed-loop system damping ration (0.75) and un-damped natural frequency of 4 rad/sec.
- For the resulted T, calculate the maximum overshoots, settling time, rise time.

Question 4: (10 marks)

Given the open loop transfer function of a control system as:

$$G(s) = \frac{K(s+8)}{(s+2.5)(s^2+4s+6)}$$

And unity feedback

- Roughly sketch the root locus.
- Determine the range of gain (K) for stable operation
- Find the value of oscillating frequency. (if exciting)
- Calculate the angle of arrival/departure (if any).

Question 5: (10 marks)

A control system with unity feedback has the forward transfer function

$$G(s) = \frac{K_n}{S(100+S)(40+S)(1+S)}$$

a. For K_n =4000 Draw the log magnitude and phase diagram.
b. For the same gain, check stability and find the Gain and Phase Margins.

Best Wishes

Members of course Examination Committee:	Signature:	Date:
Lecturer: Staff		21/12/2016
Course Coordinator : Dr. Ahmed El-Shenawy		21/12/2016
Head of Department: Prof Hamdy Ashour	Hamdy	4/1/2017