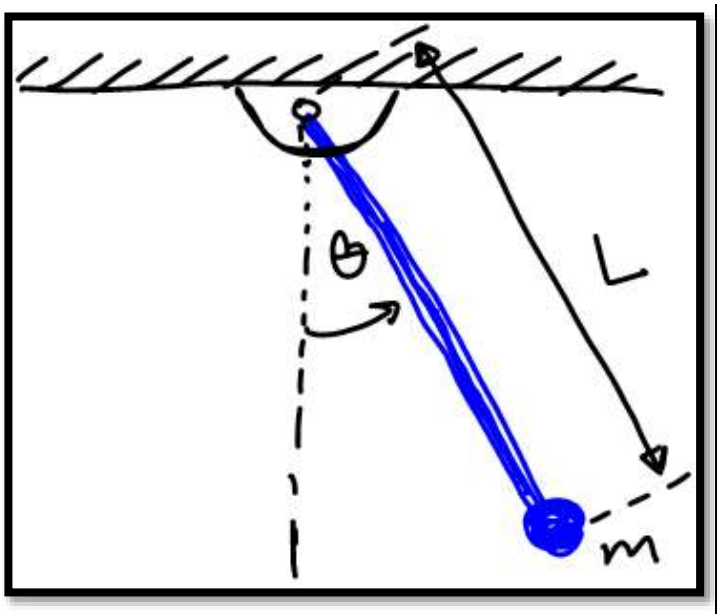
Mansoura University		Computer Engineering and Control Syst. Dept. Total Marks: 90 Marks	Faculty of Engineering
Course Title: **Control Engineering 1**			Course Code: **CSE 3116**
Date: 11 Jan. 2015		Allowed time: 3 hr.	No. of Pages: (02)
Remarks: (Answer the following questions… assume any missing data)			

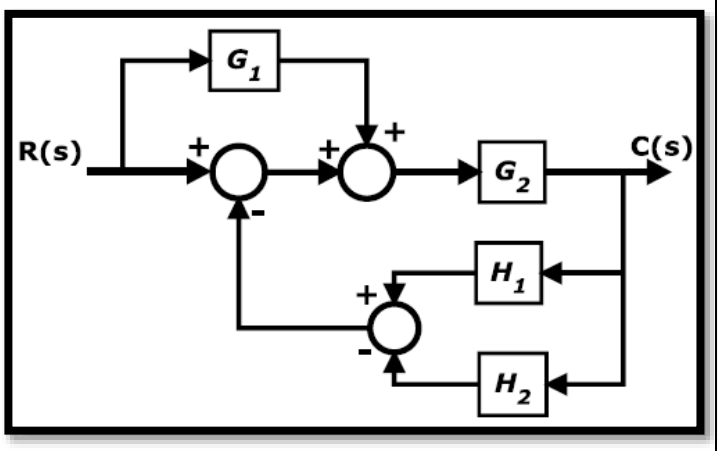
Question No. (1) (15 Marks)

For the simple pendulum shown, where $\boldsymbol{L = 0.5\,m}$, $\boldsymbol{m = 1\,kg}$, and $\boldsymbol{g = 9.8\,m/s^2}$. Create an **.m** file to **plot the linear response** of the simple pendulum when the initial angle of the pendulum is $\boldsymbol{\theta(0) = 30°}$



Question No. (2) (15 Marks)

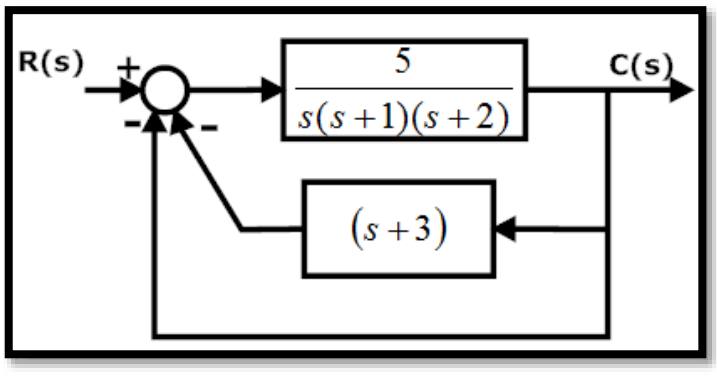
Find the closed-loop transfer function $\frac{C(s)}{R(s)}$ for the system shown below



Question No. (3) (15 Marks)

For the system shown in figure

a. Find $\boldsymbol{K_p}, \boldsymbol{K_v}$, and K_a
b. Find the steady-state error for an input of $\boldsymbol{50u(t)}$
c. Under what conditions your answer in point (b) is valid
d. State the system type



Question No. (4) (15 Marks)

Obtain the unit-impulse response of a unity feedback system whose open-loop transfer function is $\boldsymbol{G(s) = \frac{2s+10}{s^2}}$

Question No. (5) (15 Marks)

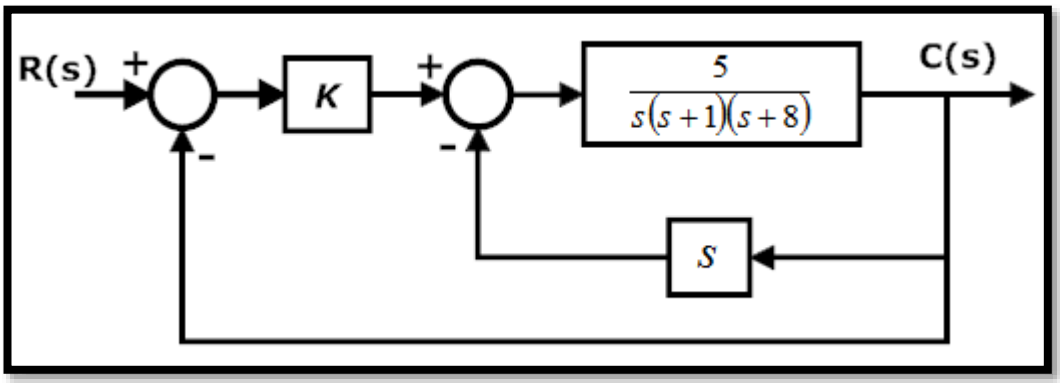
Consider the closed-loop system given by

$$\frac{\boldsymbol{C(s)}}{\boldsymbol{R(s)}} = \frac{\boldsymbol{\omega_n}}{\boldsymbol{s^2 + 2\zeta\omega_n s + \omega_n{}^2}}$$

Determine the values of $\boldsymbol{\zeta}$ ***and*** $\boldsymbol{\omega_n}$ so that the system responds to a step input with approximately 5% overshoot and with a settling time (**2%** ***criteria***) of 2 sec.

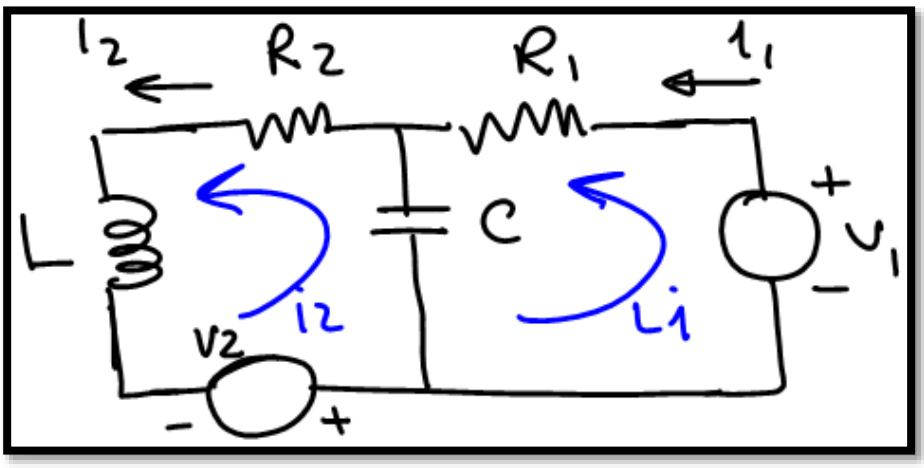
Question No. (6) (15 Marks)

A model of a ship's heading control loop is shown in the figure below. Find the range of $\boldsymbol{K}$ that will keep the system stable



Question No. (7) (15 Marks)

Sketch the block diagram for the electrical circuit show next, and then determine $\boldsymbol{\frac{I_2}{V_1}\Big|_{V_2=0}}$



Best wishes

Dr. Mostafa Elhosseini

Dr. Amira Yassien Haikel