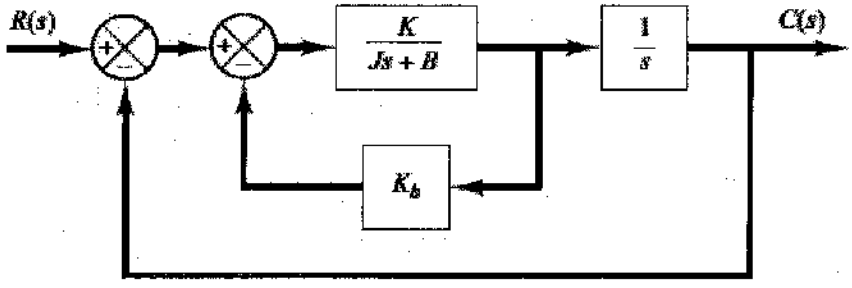
Kafrelsheikh University
Faculty of Engineering
Electrical Engineering Dept.
Final Exam
Total Marks: 70 Marks

Date: 15/03/2021
Time allowed: 3 Hours
Year: 4th Year
Subject Name: Industrial Control
Pages : 2

Course ILOS: a.1, a.4, a.5, a.10, a.11, b.1, b.2, b.3, b.11, b.13, c.1, c.2, c.3, c.4, c.7, d.6

Question (1) [15 Marks]

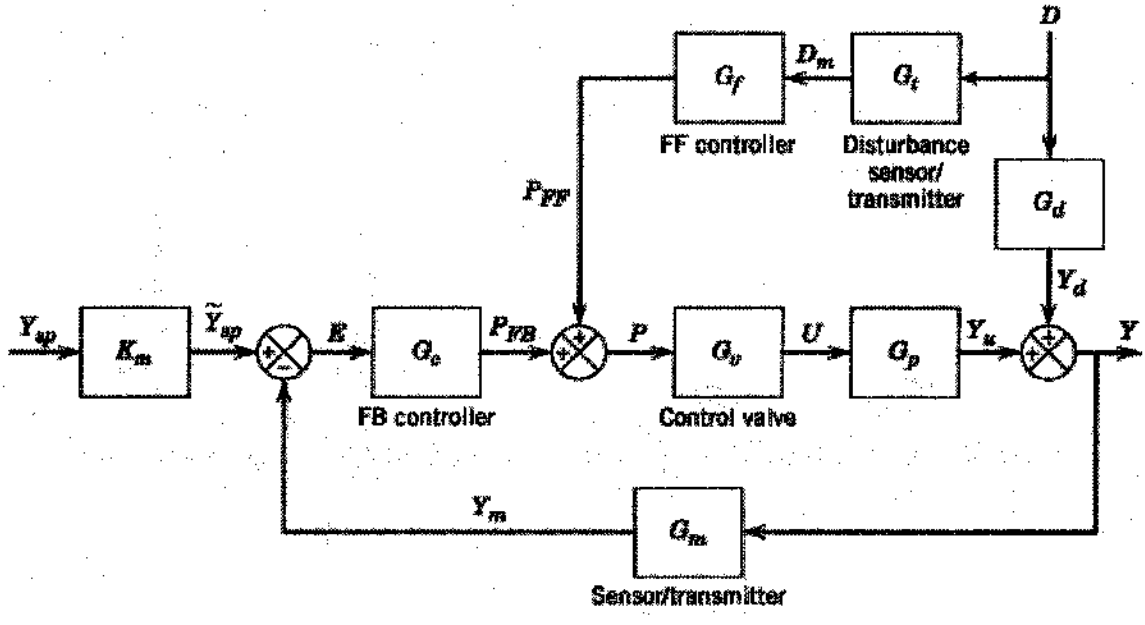
For the servo system shown in the following figure, determine the values of gain K and velocity-feedback Constant K_h so that the maximum overshoot in the unit-step response is 0.15 and the peak time is 0.8 sec. With these values of K and K_h, obtain the rise time and settling time. Assume that J=1kg-m^2 and B=0.5 N-m/rad/sec.



Question (2) [20 Marks]

A-) State the disadvantages of the feedforward controller. **[5 Marks]**

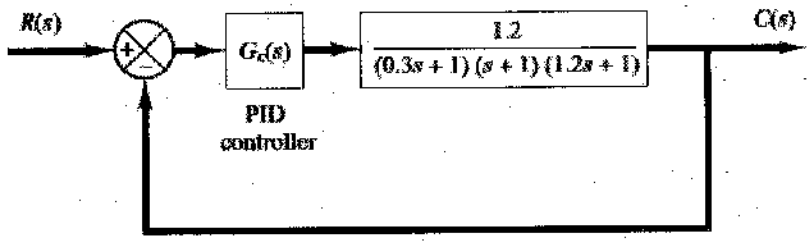
B-) Obtain the feedforward controller transfer function of the following system: **[10 Marks]**



C-) Proof that the feedforward controller has no effect on the stability of the feedback control system. **[5 Marks]**

Question (3) [20 Marks]

Apply a Ziegler–Nichols tuning rule for the determination of the values of parameters K_p , T_i, and T_d of the following figure:



Question (4) [15 Marks]

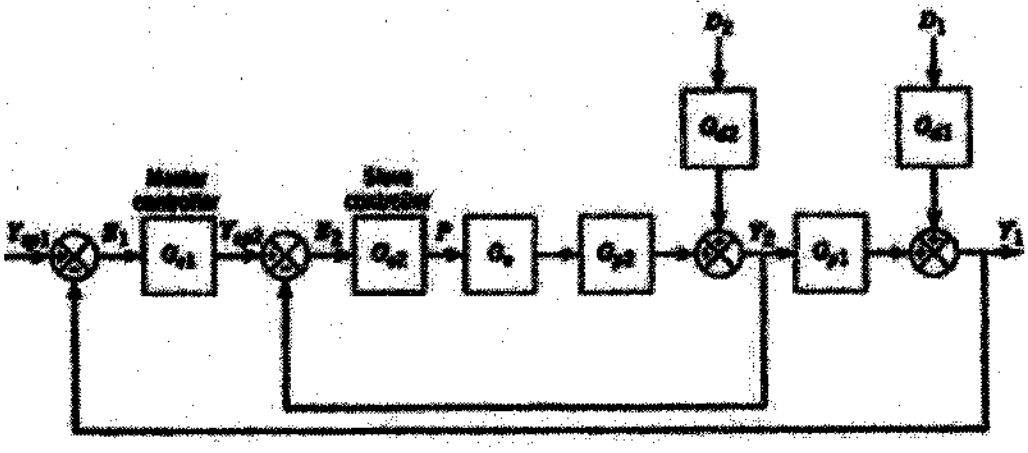
For the block diagram of the following cascade loop:

1- Drive a single transfer function from input Y_{SP2} to output Y_2, assuming D_2=0. **[5 Marks]**

2- Redraw the block diagram, replacing it now with your single block transfer function, but still incorporate the disturbance effect from D_2. **[2 Marks]**

3- What is the characteristic equation for the inner loop? **[5 Marks]**

4- If the inner loop has proportional-only controller for G_{c2}, and $G_{p2}(S) = \frac{6}{2S+1}$, and $G_V = 3$. Drive a constraint (inequality) for the value of critical gain, so that the inner loop still has stable behavior. **[3 Marks]**



With my best wishes

Dr. Sherif Emam

Sherif Emam