Menoufyia University
Faculty of Engineering
Shebin El-Kom
Final Exam.
Academic Year : 2013 – 2014
Date : 14/06/2014

Dept : Production Engineering
Year : Fourth
Subject : Automatic Control
Code : PRE
Time Allowed : 3 hours
Total Marks : 90

This exam measures the ILOs: a_1, a_2, a_3, b_1,b_2,b_3,c_1,c_2,c_3

Question (1) *(15 +10 Marks)*

a- Find the overall transfer function for the following control system:

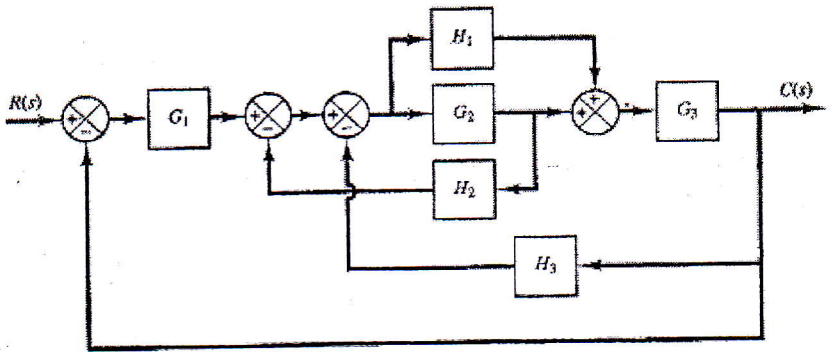

Fig. (1)

b- Using Mason's rule Find the overall transfer function for a control system has the following signal flow graph.

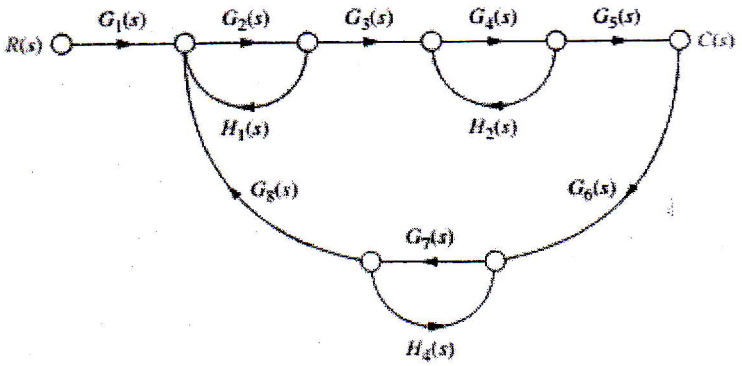

Fig. (2)

Question (2) *(10 +10 Marks)*

a- For the system shown in Fig.( ), considering $\zeta = 0.6$,$\omega_n = 5$ rad/ sec and the system is subjected to a unit- step input.

Find:

The rise time, peak time, maximum overshoot and settling time.

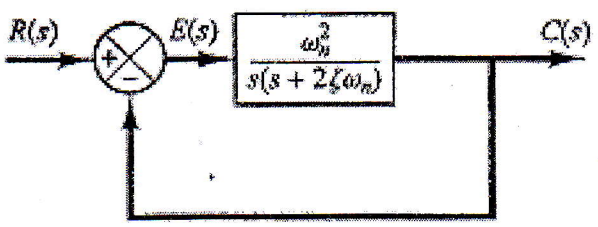

Fig. (3)

b- Given the following differential equation, solve for y(t) if all initial conditions are zero. Use the Laplace transform

$$\frac{d^2y}{dt^2} + 12\frac{dy}{dt} + 32y = 32u(t)$$

Question (3) ***(20 Marks)***

Find out the value of the controller constant (K) which makes the closed-loop control system, shown in Fig. (4), critically stable.

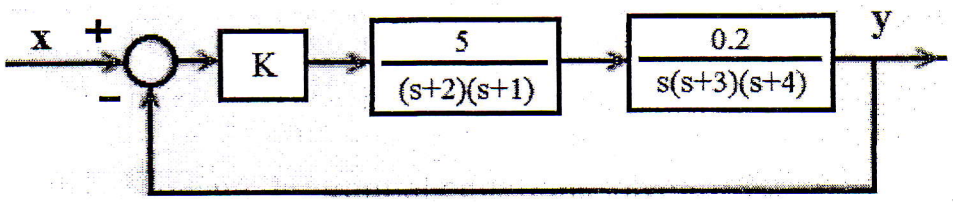

Fig. (4)

Question (4) ***(25 Marks)***

Use the closed-loop control system shown in Fig. (5) to:

1. State the stability condition of the given system.
2. Find out the values of the Gain Margin (GM) and Phase Margin (PM).

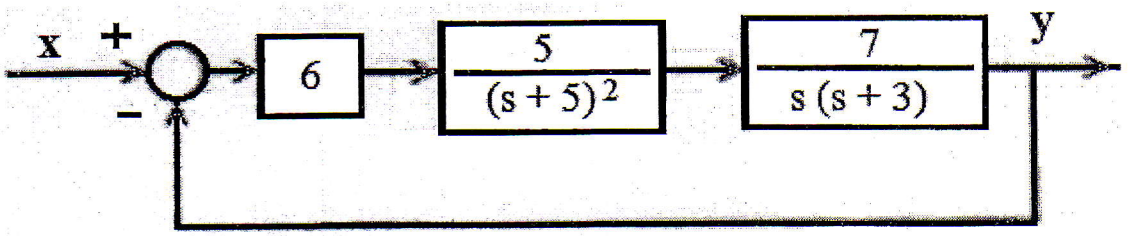

Fig. (5)