



SF-6461

B. E. - II (Sem. IV) (Comp.) Examination

May / June - 2011

Control System Engineering

Time : 3 Hours]

[Total Marks : 100

Instructions :

(1)

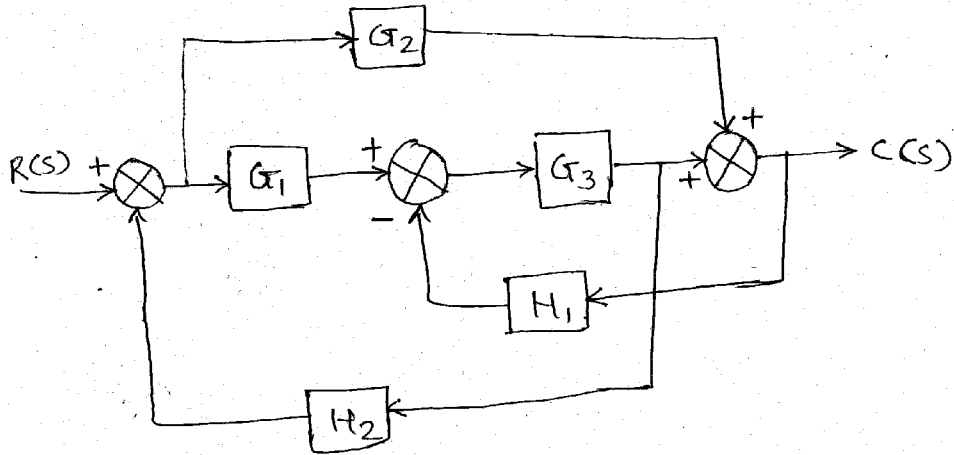
नीचे दृष्टावेक निशानीवाणी विगतो उत्तरवही पर अवश्य कभवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="text" value="B. E. - 2 (SEM. 4) (COMP.)"/>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="text" value="CONTROL SYSTEM ENGINEERING"/>	<input type="text"/>
Subject Code No. : <input type="text" value="6"/> <input type="text" value="4"/> <input type="text" value="6"/> <input type="text" value="1"/>	Section No. (1, 2,.....) : <input type="text" value="1&2"/>
Student's Signature	

- (2) Attempt all questions.
- (3) Make suitable assumption wherever necessary.
- (4) Figures to the right indicate full marks.

SECTION - I

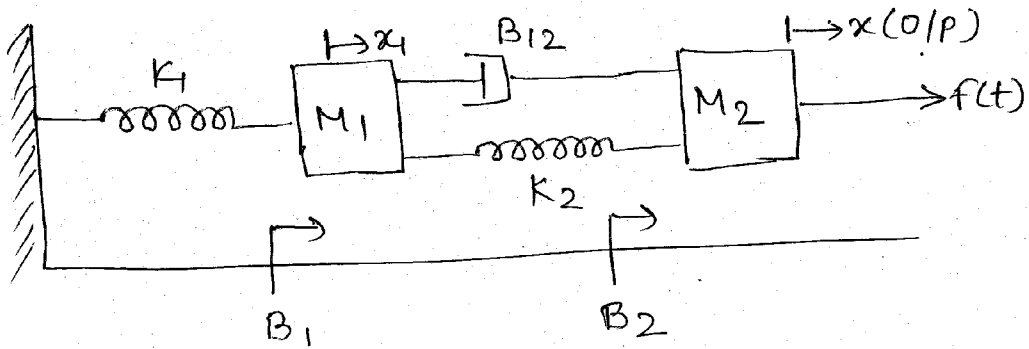
- 1 (a) State whether the following are True or False. 5
 - (i) A closed-loop control system is usually more accurate than an open-loop system.
 - (ii) Feedback is sometime used to improve the sensitivity of a control system.
 - (iii) If an open-loop system is unstable, applying feedback will always improve its stability.
 - (iv) Feedback can increase the gain of a system in one frequency range but decreases it in another.
 - (v) Discrete-data control systems are more susceptible to noise, due to the nature of their signals.
- (b) Give the following answers : 5
 - (i) Write Mason's Gain Formula.
 - (ii) What is the force-voltage analogy of Mass M ?
 - (iii) _____ is the force-current analogy of displacement.
 - (iv) What are the different types of stepper motors ?
 - (v) What is a tachometer ?

- (c) (i) Using the block diagram reduction techniques, find the closed-loop transfer function of the system whose block diagram is given in figure. 7



- (ii) Define transfer function and linear system. 3

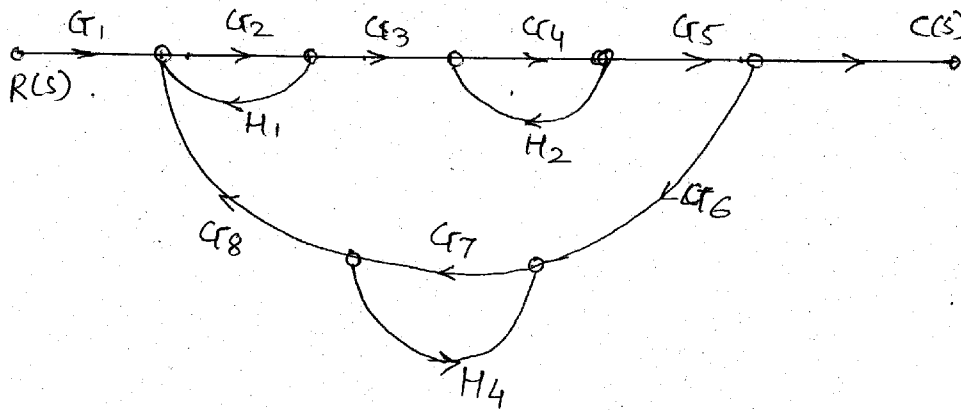
- 2 (a) Obtain the transfer function of the mechanical system shown in figure. 7



- (b) Derive the analogous relationship between mechanical system and electrical system based on force (torque) - current analogy. 8

OR

- (a) Find the transfer function for the figure using signal flow graph. 7



(b) Derive the transfer function for armature controlled DC motor. 8

3 Write a short note (any three) 15

- (i) Steeper motor
- (ii) AC servomotor
- (iii) Tachometer
- (iv) DC servomotor
- (v) Synchros
- (vi) Force (torque) - Voltage analogy.

SECTION - II

4 Attempt all question.

- (1) For the system to be stable the gain cross over frequency should _____ than phase cross over frequency. (More, less, exactly, equal) 2
- (2) The first column of Routh array contains the following numbers 1,5,-7,4,4. Comment on the stability of the system. 2
- (3) For a system to be stable all the roots of the characteristic equation must lie on the _____ side of s plane. 2
- (4) The M circle is a plot of _____. 2
- (5) Nyquist criteria is used to assess _____ stability from _____ transfer function. 2

- (6) For a system $GH = s^3 + 3Ks^2 + (K+2)s + 1$, find the range of K for which system is stable and the frequency of oscillations. **6**
- (7) Write a short note on the shortcomings of RH criteria and the suggested remedies. **4**
- 5** (1) For the system defined by the transfer function **10**
 $GH = \frac{10}{s(s+1)(s+3)}$ find the gain margin and the phase margin using the Bode diagram.
- (2) Write down the correlation between time domain specifications and the frequency domain specifications. **5**
- OR**
- 5** (1) For the system whose transfer function is given **10**
by $GH = \frac{1}{(s+5)(s+1)(s+3)}$, draw the nyquist plot and comment on the stability.
- (2) Explain the concept of encirclement and enclosure of a point in complex variable system. **5**
- 6** Attempt any three : **15**
- (1) Write a short note on N circle and its significance.
- (2) Write a short note on gain margin and phase margin.
- (3) Discuss briefly the principle of Argument in Complex variable system.
- (4) Write the steps to develop Nichol's chart from constant M and N circles.
-