

4/6/13  
L2B

Code No: 09A50204

R09

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B. Tech III Year I Semester Examinations, May/June – 2013

Control Systems

(Common to EEE, ECE, ETM)

Time: 3 hours

Max. Marks: 75

Answer any five questions  
All questions carry equal marks

- 1.a) Explain the various types of control systems with suitable examples.
- b) Obtain the transfer function of the mechanical system in figure 1. [15]

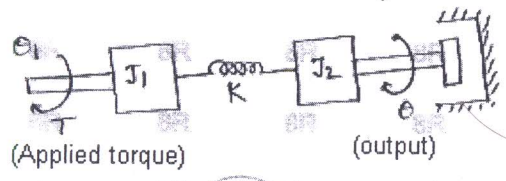


Figure.1

- 2.a) Determine the transfer function of the block diagram shown in figure 2.

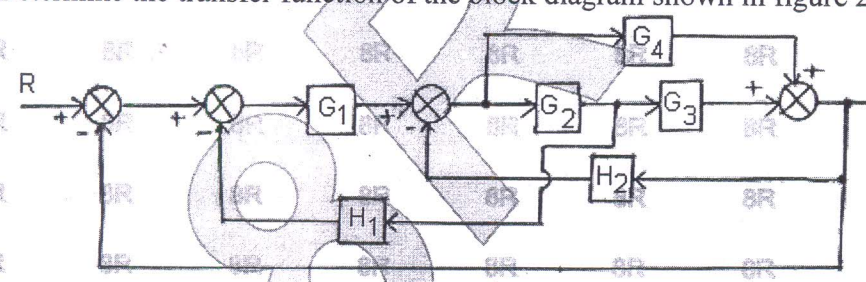


Figure.2

- b) Determine the closed loop transfer function for the signal flow graph shown in figure 3. [15]

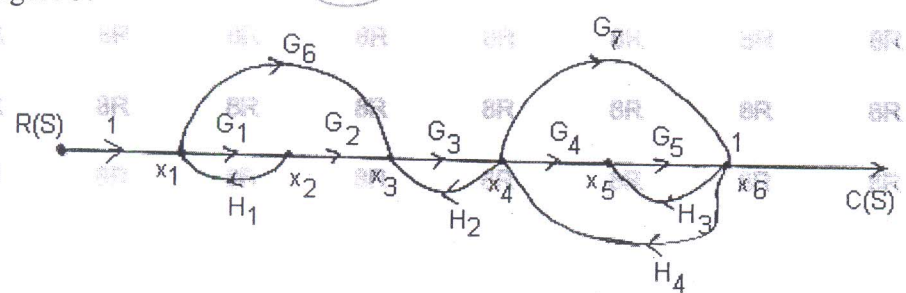


Figure.3

- 3.a) Define transfer function and determine the transfer function of the DC servo motor.
- b) Explain the operation of Synchro Transmitter. [15]

- 4.a) Explain the standard test signals that are used in the time-domain analysis.
- b) A unity feedback control system has an open loop transfer function  $G(s)=K/s(s+10)$ . Determine the gain 'K' so that the system will have a damping ratio of 0.5. For this value of 'K', determine the settling time, peak overshoot and time to peak overshoot for a unit-step unit. [15]

5. Define phase margin and gain margin and sketch the bode plot for the following transfer function:  
 $G(s) H(s) = K s^2 / (1+0.25s) (1+0.025s)$  [15]

6. The open loop transfer function of a unity feedback system is given by

$$G(s) = K / (s+2) (s+4) (s^2+6s+25)$$

Using R-H criterion discuss the stability of the closed-loop system as a function of 'K'. Determine the values of 'K' which will cause sustained oscillations in the closed-loop system. What are the corresponding oscillation frequencies? [15]

7. A unity feedback control system has an open loop transfer function

$$G(s) = K/s^2 (s+2)$$

Sketch the Root-Locus plot and show that the system is unstable for all values of 'K'. [15]

8. Write short notes on:

- Procedure to sketch the polar plot.
- Lead- Compensation.
- State Transition Matrix and its properties.

[15]

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