

B. Tech 6th Semester Examination

Control Systems (NS)

EC-322

Time : 3 Hours

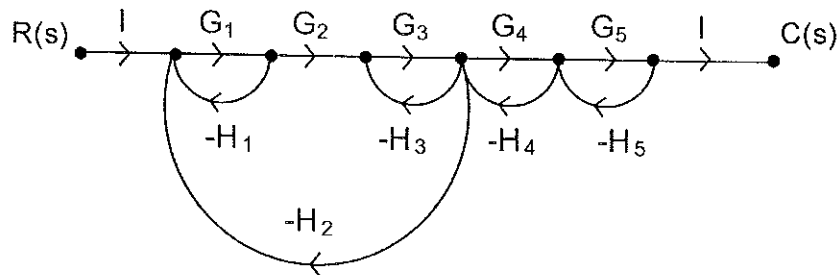
Max. Marks : 100

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

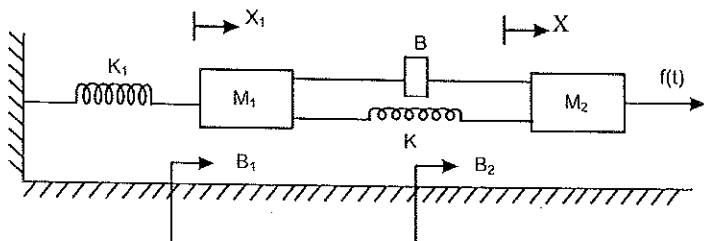
Note : Attempt five questions in all, selecting one question each from section A, B, C & D. Section-E is compulsory.

SECTION - A

1. (a) For the Signal flow graph shown below find C/R , using Mason's gain formula. (10)

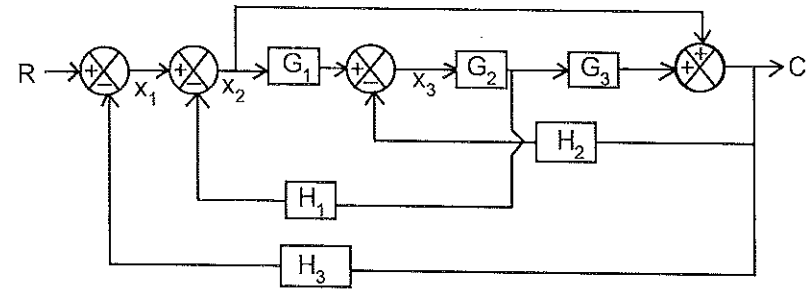


- (b) Write the differential Equations governing the mechanical system shown in the Fig. and determine the transfer function. (10)



[P.T.O.]

2. (a) Determine the Transfer Function of the system Shown in the Fig. (10)



- (b) What do you mean by open loop and closed loop systems. Explain the concept of feedback. (10)

SECTION - B

3. (a) Derive Expression for Rise time, fall time, settling time, peak overshoot. (10)
- (b) The carrier frequency of a broadcast FM signal is 100 MHz. Maximum deviation is 75 KHz. If the highest audio frequency modulating the carrier is limited to 15 KHz. What is the approximate bandwidth required? (10)
4. Derive an Expression to find steady state error of closed loop system. (20)

SECTION - C

5. A unity feedback control system has $G(s) = ks^2 / (1+0.02s)(1+0.02s)$. Draw the Bode plot. Find K when GCOF = 5rad/sec. (20)
6. Determine the range of K for stability of unity feedback system whose OLTF, is $G(s) = \frac{k}{s(s+1)(s+2)}$. Using RH criterion. (20)

(20)

SECTION - D

7. Determine the state Controllability and Observability of the system described by

$$x = \begin{bmatrix} -3 & 1 & 1 \\ -1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix} x + \begin{bmatrix} 0 & 1 \\ 0 & 0 \\ 2 & 1 \end{bmatrix} u \quad y = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix} x \quad (20)$$

8. (a) Mention in detail a state space representation of a continuous time systems. (10)
- (b) Mention in detail a state space representation of a discrete time systems. (10)

SECTION - E

9. (a) Define Transfer Function of the System.
- (b) Write Mason's gain formula of Signal flow graph.
- (c) What is meant by steady state error?
- (d) Define rise time.
- (e) What is the need for compensation?
- (f) What is BIBO stability Criterion?
- (g) State any two limitations of Routh-stability criterion.
- (h) What is Observability?
- (i) What is Alias in sampling process?
- (j) Define State and State Variable. (2×10=20)