



SF-6527

**B. E. II (Sem. IV) (IC) Examination**  
**May / June - 2011**  
**Control Theory**

Time : 3 Hours]

[Total Marks : 100

**Instructions :**

(1)

नीचे दृष्टावेक निशानीवाणी विगतो उत्तरवडी पर अवश्य लपवी.  
Fillup strictly the details of signs on your answer book.

Name of the Examination :  
B. E. 2 (SEM. 4) (IC)

Name of the Subject :  
CONTROL THEORY

Subject Code No. : 6 5 2 7 Section No. (1, 2,.....): Nil

Seat No. :

Student's Signature

(2) Numbers on the right hand side indicate marks.

- 1 (a) Answer the following questions : 10
- (1) Give two disadvantages of open loop control system. 2
  - (2) Define the following terms : 2
    - (i) Poles (ii) Type of a system.
  - (3) State Mason's gain formula and define all terms used in it. 2
  - (4) What do you mean by steady state response of a system ? 2  
Show it with diagram.
  - (5) State and define parabolic input mathematically. 2  
What is its laplace transform ?
- (b) Derive the equation for the steady state error of a simple closed loop system. 8
- 2 (a) Reduce the give block diagram using block diagram reduction rules and hence obtain the transfer function.  $C(s)/R(s)$ . 8

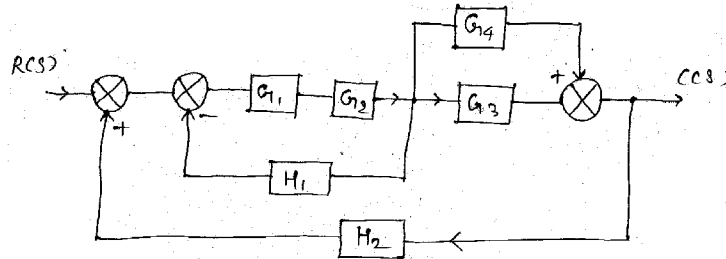


Fig. 1

(b) Find  $\frac{C(s)}{R(s)}$  using Mason's gain formula.

8

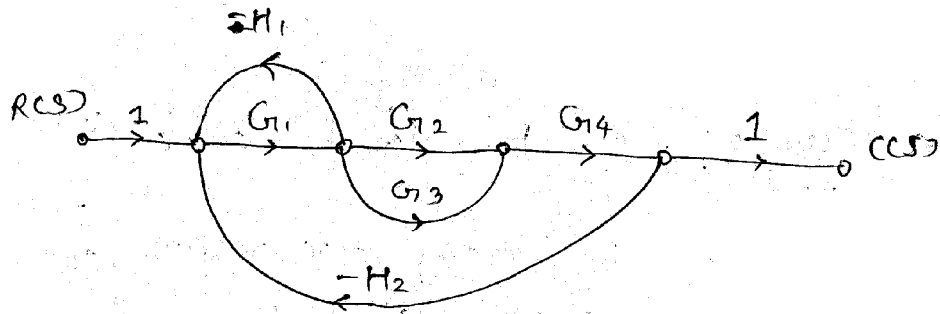


Fig. 2

OR

2 (a) Reduce the given block diagram using block diagram reduction rules and hence obtain its equivalent transfer function.  $C(s)/R(s)$

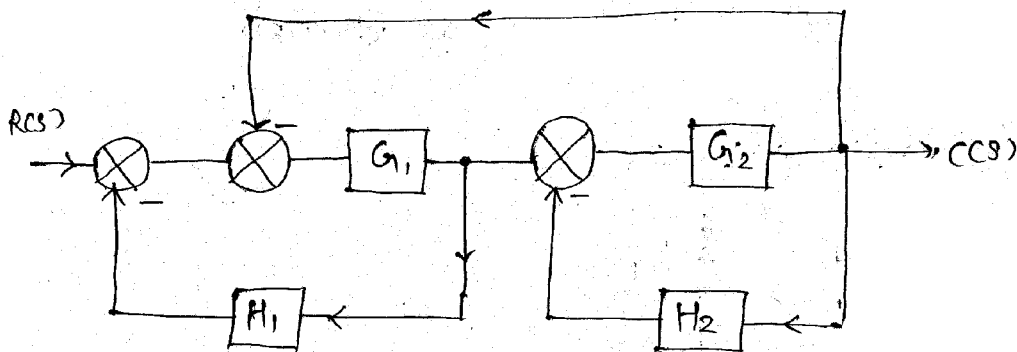


Fig. 3

(b) Find  $\frac{C(s)}{R(s)}$  using Mason's gain formula.

8

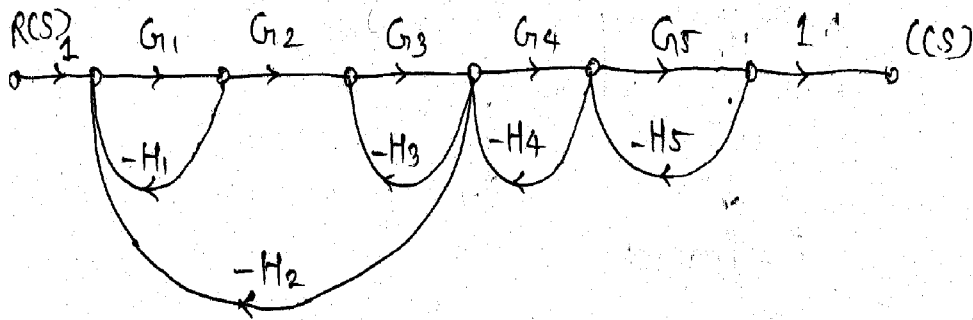


Fig. 4

3 Attempt any two :

8×2=16

(1) A second order system is given by  $\frac{C(s)}{R(s)} = \frac{25}{s^2 + 6s + 25}$ . Find all time domain specifications.

(2) Explain different types of damping.

(3)

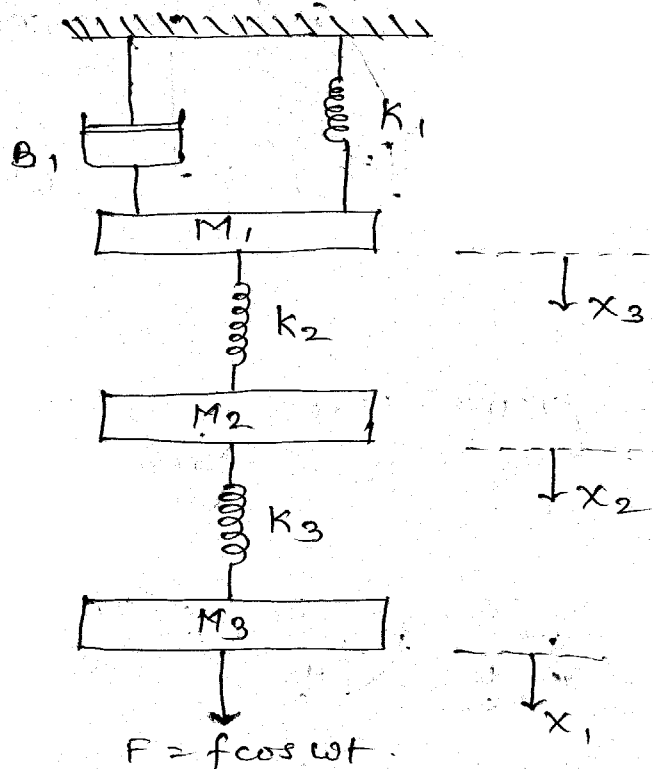


Fig. 5

For the above system, write equilibrium equations and obtain electrical analogous ckt using force voltage and force current analogy.

- 4 (a) Answer the following terms : 10
- (1) Define the following terms : 4
- (i) Cutt off frequency
- (ii)  $W_d$
- (iii) Cutt off rate
- (iv) relative stability.
- (2) State Routh Hurwitz Criterion. 2
- (3) How should be the poles located in s-plane for a system to be,
- (i) Stable system
- (ii) Marginally stable system.
- (4) Give two advantages of frequency domain methods. 2
- (b) Explain all frequency response specifications. 8

- 5 (a) A unity feedback control system  $G(s) = \frac{100}{s(s+0.5)(s+10)}$  . 10

Draw bode plot. Find  $W_{gc}$ ,  $W_{pc}$ , G.M., P. M.  
comment on stability.

- (b) Sketch root locus for following system. 6

$$G(s) H(s) = \frac{K}{s(s^2 + 2s + 2)}$$

**OR**

- 5 (a) For the unity feedback system given below, draw bode plot. 10

$$G(s) = \frac{100(s+4)}{s(s+0.5)(s+10)}$$

• Comment on stability.

- (b) For the system given below draw root locus.

$$G(s) H(s) = \frac{K(s+4)}{s(s^2 + 2s + 2)}$$

- 6 Attempt any two : 8×2=16

- (1) Explain polar plot s.
- (2) Give an example and explain Routh Hurwitz method when the 1st element in Routh array become zero and all other elements are non - zero.
- (3) What are standard test inputs. Derive equations for steady state error for step and ramp input for type 0.1 and 2 systems.