Printed Pages – 6

5068

B.Tech. Examination, 2017

(Fifth Semester)

(E.C. Branch)

CONTROL SYSTEM - I

Paper – IV

Time Allowed : Three Hours

Maximum Marks : 100

Note : Attempt any five questions.

Q. 1. (a) Explain different block diagram reduction techniques. **10**

(b) What do you mean by signal flow graph ? Explain Mason's gain formula. **10**

Q. 2. (a) For the block diagram shown in fig.-1, determine $\frac{C}{R}$ by block diagram reduction rules. **10**

P.T.O.

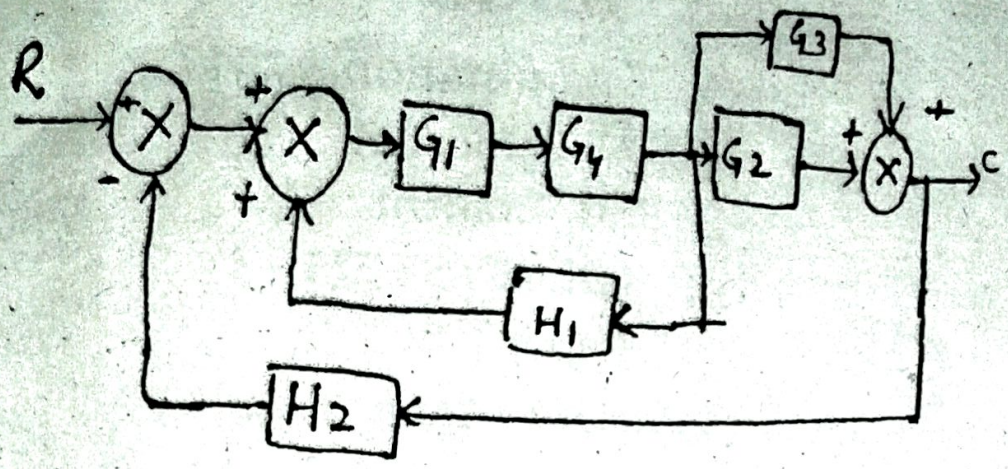


Fig. 1

(b) Find the transfer function $\frac{y_5}{y_1}$ for the signal flow graph shown in fig-2. 10

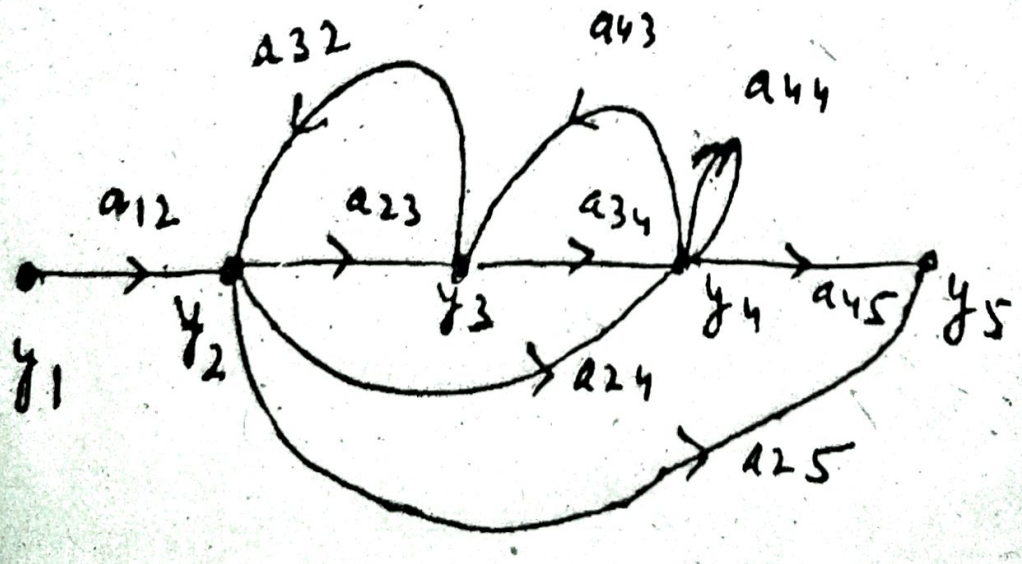


Fig. 2

Q. 3. (a) Explain force-voltage and force current analogy. 10

(b) Draw the electrical analogous circuit using force-voltage and force-current analogy for the mechanical system shown in fig-3. 10

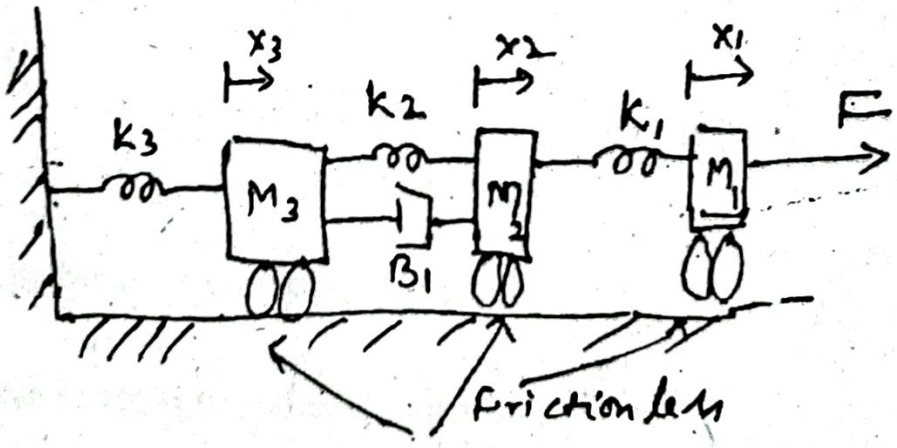


Fig. 3

Q. 4. (a) Describe different types of test input signal. 10

(b) Derive the expression for peak time and maximum over shoot in time domain analysis. 10

Q. 5. (a) Explain time response analysis of a second order system subjected to a unit step input. 10

(b) The forward path transfer function of a unity feed back system is given by

$$G(s) = \frac{5\left(s^2 + 2s + 100\right)}{s^2(s+5)(s^2+3s+10)}$$

Determine static error coefficients. Also determine the order and type of system. 10

Q. 6. (a) Define state, state variable and state transition matrix. Write down the properties of state transition matrix. 10

5068

(b) Obtain the state space representation of the system by the differential equation :

$$\frac{d^3y}{dt^3} + 5\frac{d^2y}{dt^2} + 10\frac{dy}{dt} + 20y = 8u(t)$$

where y is output and u is input. **10**

Q. 7 (a) Draw the root locus diagram of a unity feedback control system as K varies from zero to infinity whose forward path transfer function is given by : **10**

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

(b) State and explain Nyquist stability criterion. **10**

Q. 8. Write short notes on any four of the following : **20**

(i) Open loop and closed loop system.

(ii) Advantages of state space techniques.

(iii) Bode plot.

(iv) Routh-Hurwitz criterion of stability

(v) Settling time

(vi) Effects of adding a zero to forward path

Printed Pages – 5

1068

B.Tech. Examination, 2016

(Fifth Semester)

(E.C. Branch)

CONTROL SYSTEM - I

Paper-IV

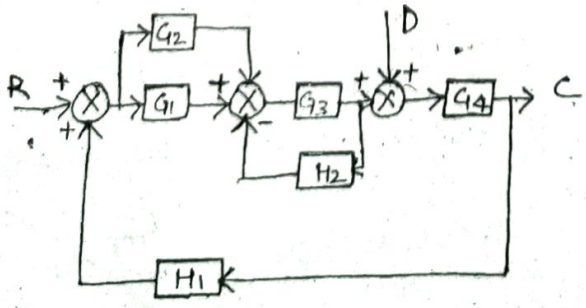
Time Allowed : Three Hours

Maximum Marks : 100

Note : Attempt any five questions.

Q. 1. (a) Explain the block diagram of reduction rules. 10

(b) Determine the ratio C/R, C/D and the total out put for the system. 10

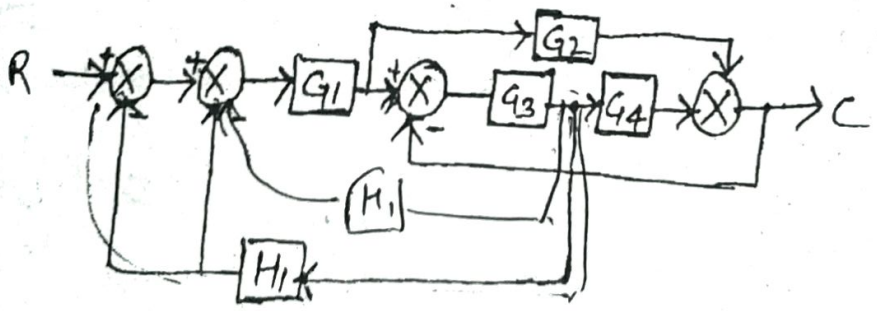


Q. 2. (a) Determine the overall gain for the following set of equations :

$$x_2 = ax_1 + fx_2,\ x_3 = bx_2 + ex_4$$

$$x_4 = cx_3 + hx_5,\ x_5 = dx_4 + gx_2$$

(b) Draw the signal flow graph and determine the overall transfer function of the following block diagram. 10



Q. 3. (a) Explain the force voltage analogy and force current analogy. 10.

(b) Find the transfer function of hydraulic system. 10

Q. 4. (a) Determine the stability of a system having following characteristic equation : 10

$$s^6 + s^5 + 5s^4 + 3s^3 + 2s^2 - 4s - 8 = 0$$

(b) Using Routh criterion investigate the stability of a unity feedback control system whose open loop transfer function is given by 10

$$G(s) = \frac{e^{-sT}}{s(s+2)}$$

Q. 5. Find the time responce of a second order control system subjected to unit step input function. 20

Q. 6. (a) The closed loop transfer function of a unity feedback control system is given by

$$\frac{C(s)}{R(s)} = \frac{Ks + \beta}{s^2 + \alpha s + \beta}$$

Determine the steady state error for unit ramp input.

10

(b) The open loop transfer function of a control system is given by

10

$$G(s)\,H(s) = \frac{K(s+1)^2}{(s+2)^2}$$

Show that the root locus lies on a circle.

Q. 7. Write the short note on any two : 10×2=20

(i) Properties of state transition matrix

(ii) Gain margin and phase margin

(iii) Phase-Lag-Lead compensation.

NSS

NSS **392**

B.Tech. Examination, 2014

(Fifth Semester)

(E.C. Branch)

CONTROL SYSTEM - I

Paper - IV

Time Allowed : Three Hours

Maximum Marks : 100

Note : Attempt any five questions.

Q. 1. (a) Define the following terms : 10

(i) Open loop and closed loop control system

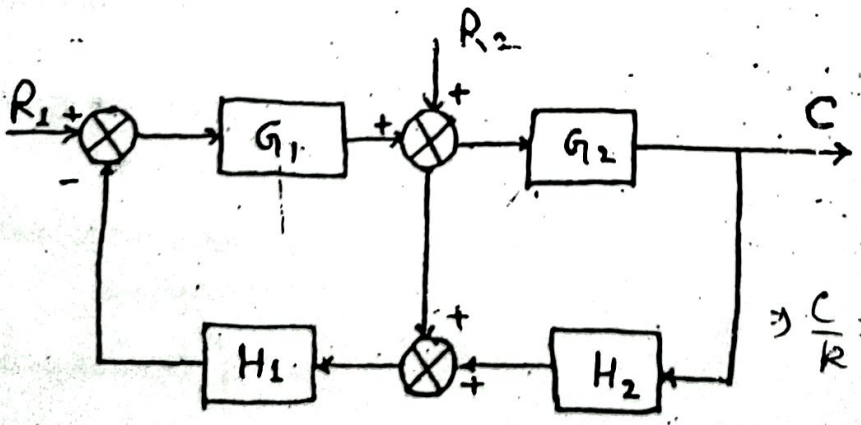
(ii) Force-voltage analogy

(iii) Gain margin

(iv) Phase margin

(v) Dummy nodes

(b) Derive an expression for the total output for the system represented by the block diagram in fig. 1. 10



$\Rightarrow \frac{C}{R} = \frac{G_1G_2 + G_2G_3}{1 + G_2H_2}$

Fig. - (1)

Q. 2. (a) Find the transfer function of following signal flow graph. 10

392

5067

ch. Examination, 2017

(Fifth Semester)

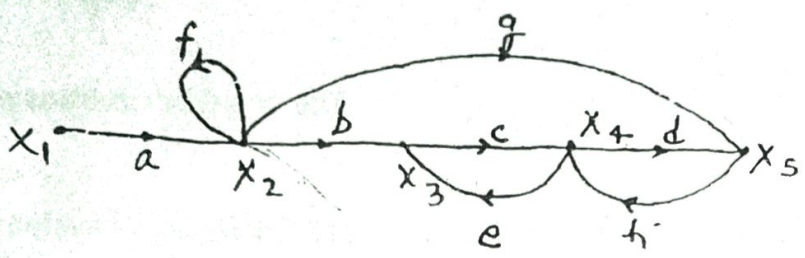


Fig. - (2)

(b) Derive the expression for time response of the second order control system subjected to unit ramp input. 10

Q. 3. (a) The open-loop transfer function of a unity feedback control system is given by :

$$G(s) = \frac{k(s+2)}{s^3 + \beta s^2 + 4s + 1}$$

Determine the value of K and β such that the closed loop unit step response has $W_n = 3$ rad/sec and $\zeta = 0.2$. 10

(b) The closed loop transfer functions of a unity feedback control system is given by :

$$\frac{C(s)}{R(s)} = \frac{Ks + \beta}{s^2 + \alpha s + \beta}$$

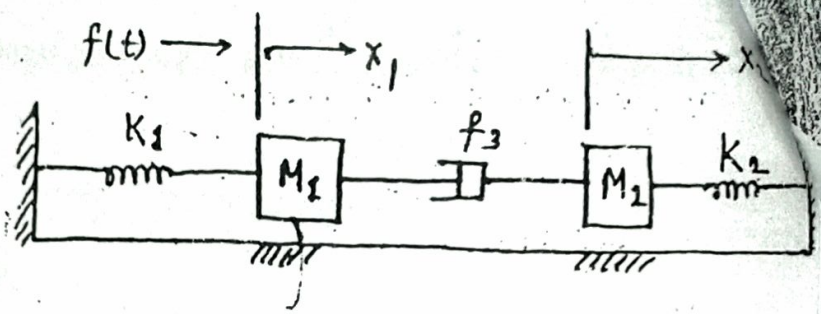
Determine the steady state error for unit ramp input. 10

Q. 4. Sketch the root locus plot for the system having open-loop transfer function is given by : 20

$$G(s)\,H(s) = \frac{k}{s(s+4)(s^2+4s+13)}$$

Q. 5. (a) Draw the mechanical circuit diagram for the system given bellow and write system equations. 10

392



(b) Derive the expression for transfer function

D.C. motor.

10

Q. 6. (a) Define the following terms ;

(i) the rise time

(ii) settling time

20

(iii) maximum overshoot

(iv) peak time

(v) critical damping

10

Q. 8. Write short notes on any four of the following : 2

(i) Relative stability

(ii) Application of Bode plot

(iii) Transient response

(iv) State transition matrix

(v) Thermal system

H

5318

B.Tech. Examination, 2013

(Fifth Semester)

(E. C. Branch)

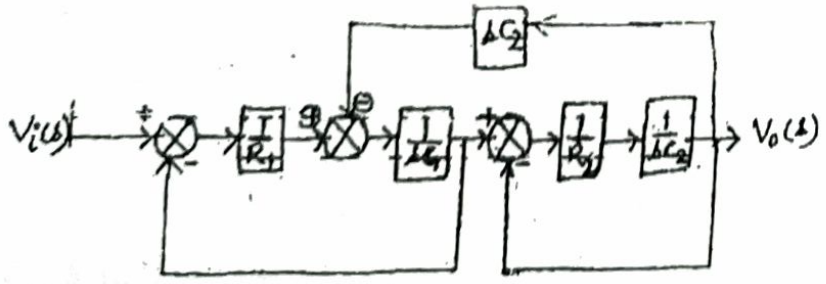
CONTROL SYSTEM - I

Paper - IV

Time : Three Hours] **[Maximum Marks : 100**

Note :– . Attempt any **five** questions.

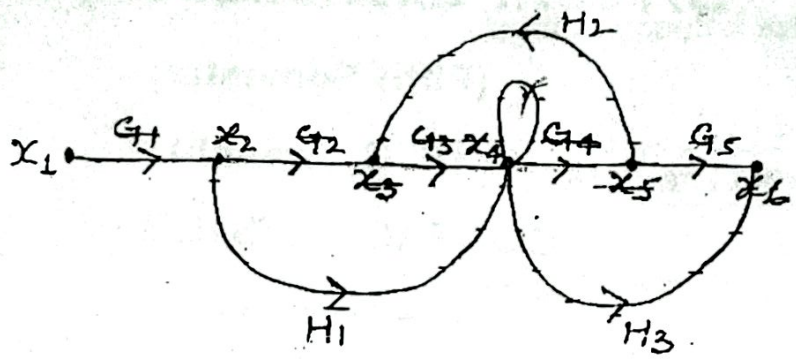
1. (a) Find the overall transfer function of the given system 10



(b) Explain the open loop and closed loop control system and give the advantages and disadvantages of both the systems.

[P. T. O.

2. (a) Find the transfer function by using Mason's gain formula of the given signal flow Graph 10



(b) Explain the following terms with respect to the signal flow graph : 10

(i) Forward path

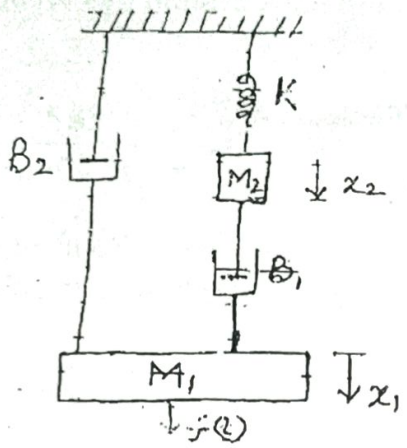
(ii) Nontouching loops

(iii) Loop gain

(iv) Dummy Nodes

3. (a) Give the Force - Voltage and Force-Current analogy of the translational Spring-Mass-Damper system. 10

(b) Draw the analogous electric network of the mechanical system. 10



4. (a) Find the time response of the second order control system subjected to unit step input and also determine the steady state error. 10

(b) Explain the following : 10

(i) Peak time

(ii) Rise time

(iii) Settling time

(iv) Delay time

(v) Maximum overshoot

5. (a) Determine the stability of a system whose characteristic equation is : 10

$$S^4 + 5S^3 + 20S^2 + 40S + 50 = 0$$

(b) Determine whether any of the roots of the following polynomial are in the RHP. 10

$$Q(s) = s^6 + 4s^5 + 3s^4 + 2s^3 + 4s + 4$$

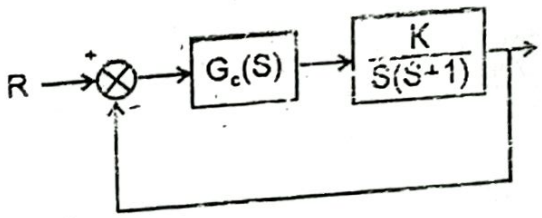
P. T. O.

5. (a) Draw the Bodeplot of the open loop transfer function :

$$G(S) = \frac{200(S+10)}{S(S+5)(S+20)}$$

(b) What is Nyquist stability criterian? Explain with suitable example.

6. Consider the system shown below :



Design lead compensator of this system to meet the following specifications :

Damping ratio = 0.7

Settling time = 1.4 sec.

7. (a) Consider the following transfer function. Obtain the state space representation of the given system using controllable canonical form.

(b) A linear time invariant system is characterised by the state variable model. Comment on the controllability and observability of the system

2068

B. Tech. Examination, 2012

(Fifth Semester)

(E. C. Branch)

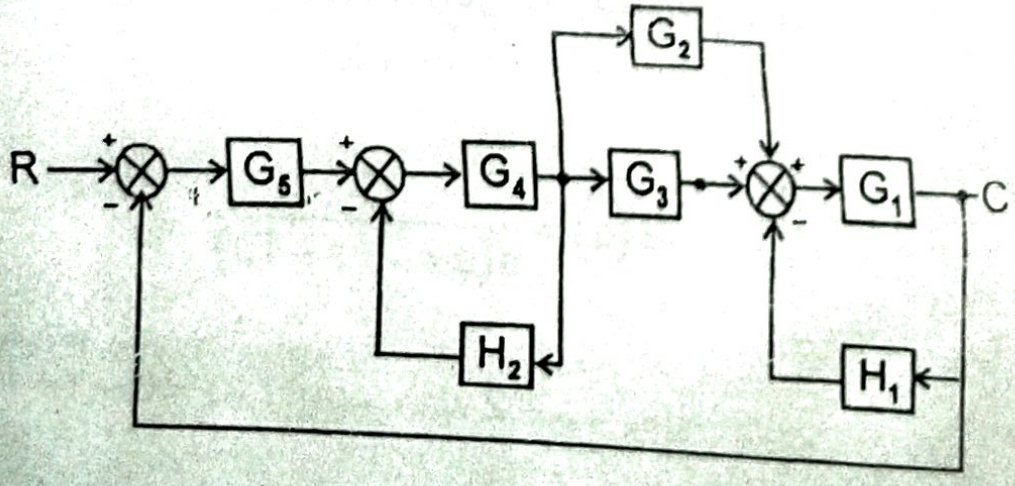
AUTOMATIC CONTROL SYSTEM

Paper IV

Time : Three Hours] [Maximum Marks : 100

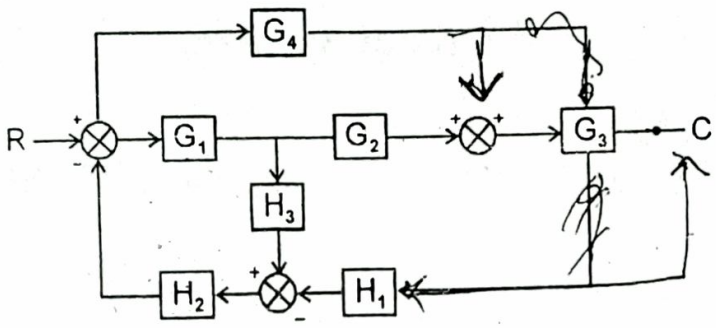
Note :– Attempt any five questions. All questions carry equal marks.

1. (a) Using block diagram reduction technique find the closed - loop transfer functions of the following system :



[P. T. O.

(b) Draw an equivalent signal flow graph and determine C(s) / R(s) : 3. (a)



(b)

2. (a) Obtain the unit step response and unit impulse response of the following system

$$\frac{C(s)}{R(s)} = \frac{10}{S^2 + 2S + 10}$$ 4. (a)

(b) Determine the generalized error coefficients and steady state error for

(b)

$$G(s) = \frac{1}{s(s+1)(s+10)}$$

and H(s) = s + 2 with input r (t) = 6 + t + t^2

3. (a) Sketch the pole - zero plot of the system :

$$G(s) = \frac{S+1}{s^2\left(s^2+5s+6\right)}$$

(b) Discuss the stability of the following systems whose closed loop transfer functions are given by

(i) $T(S) = \frac{5(S+1)}{S^3+3S^2+5S+3}$

(ii) $T(S) = \frac{S-2}{(S+4)(S^2+2)}$

4. (a) Test the stability of a system whose characteristics equation is :

$$S^3 + 5S^2 + 6S + 30 = 0$$

(b) Sketch the root locus for a system with open loop transfer function

$$G(S)\,H(S) = \frac{K(S+1)}{(S+2)(S+3)(S+4)}$$

(Fifth Semester)

(E.C. Branch)

MICROPROCESSORS

Paper - III

Time Allowed : Three Hours

Maximum Marks : 50

(b) A unity feedback control system having open-loop transfer function : 10

$$G(s) = \frac{s+2}{s(s+1)}$$

is subjected to a unit step input. Determine the peak time t_p and % maximum overshoot.

Q. 7. The open-loop transfer function of a unity feedback control system is given by : 20

$$G(s) = \frac{K}{s(sT_1+1)(sT_2+1)}$$

Applying Routh-Hurwitz criterion determine the value of K in terms of T_1 and T_2 for the system to be stable.