Student Exam. No._____

Ganpat University

B. Tech. Semester: 4th (Biomedical & Instrumentation) Engineering

CBCS Regular Examination May-June 2014

2BM402: Control System Engineering

MAXM Time -: 3 Hours **MAXM Marks -: 70**

Instructions:

1. All the questions are compulsory.
2. Answer of each section must be written in separate answer books.
3. Figure to the right indicate marks.
4. Assume data, if needed.
5. Conventional terms / notations are used.

SECTION – I

Que-1 12

(a) **Explain basic mechanical components used in control system.**

(b) **Discuss the frequency response specification of a control system.**

OR

Que-1 12

(a) **Draw an electrical analogous circuit analogy and derive the transfer function of the system shown in figure 1.**

(b) **Define the TF and give all the characteristics of Transfer Function.**

Que-2 11

(a) **Draw the mechanical equivalent network, Write the system equation and find $F(s)/X_2(s)$ of the system shown in figure 2.**

(b) **Sketch the polar plot for** $G(s)=\frac{1}{S(1+S)(1+2S)}$

OR

Que-2 11

(a) **Derive the transfer function of armature controlled DC motor**

(b) **Write the short note on AC servomotors.**

Que-3 12

(a) **Construct bode plot for the system whose open loop transfer function is given below** $G(s)=\frac{4}{S(1+0.5S)(1+0.1S)}$

Determine: (i) Gain margin. (ii) Phase margin.

(b) **Enlist advantages and disadvantages of feedback in control system.**

gtu.infinet.ac.in

SECTION – II

Que-4 12

(a) Give the difference between open loop and close loop control system. Also give any one example for open loop and close loop control system.

(b) Define: (i) error signal (ii) Transient response.
(iii) Delay time (iv) Forward path gain.
(v) Steady State error

OR

Que-4 12

(a) Explain four standard test signals.

(b) Obtain the transfer function for the block diagram shown in figure 3 using block diagram reduction technique.

Que-5 11

(a) For the 2nd order system to unit step input, derive the expression for peak time and Rise time.

(b) Consider the system whose forward path transfer function
$G(s)=\frac{16}{S(S+0.8)}$ and $H(s)= 1 + as$
Determine the value such that the damping ratio is 0.5. Also obtain the values of rise time and maximum overshoot Mp in its step response.

OR

Que-5 11

(a) Using Mason's gain formula determines the ratio C/R for the system given in the figure 4.

(b) Give a brief account of difficulties associated in using Routh's stability criterion and suggest the solution.

Que-6 12

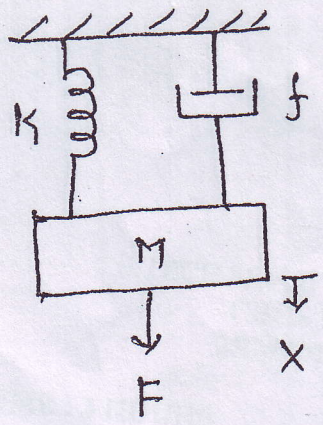
(a) Consider a unity feedback control system with the following feed forward transfer function $G(s)=\frac{K}{S(S^2+4S+8)}$, Plot the root locus for the system.

(b) Determine the stability of the system by Routh-Hurwitz criterion whose characteristics equation is given below.

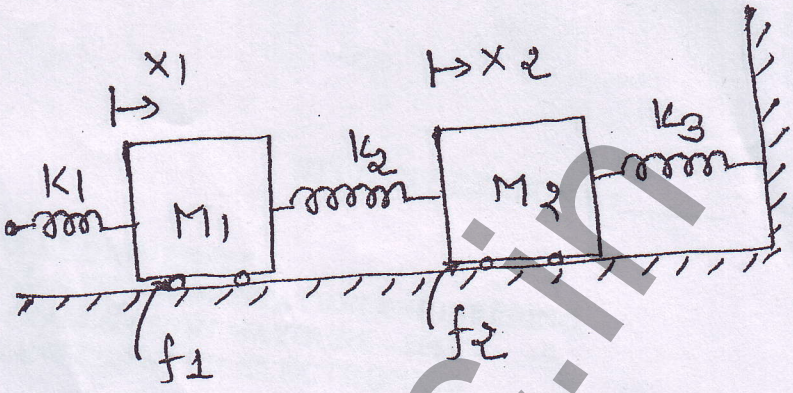
$S^5+2s^4+24s^3+48s^2-25s-50=0$

---------- END OF PAPER --------

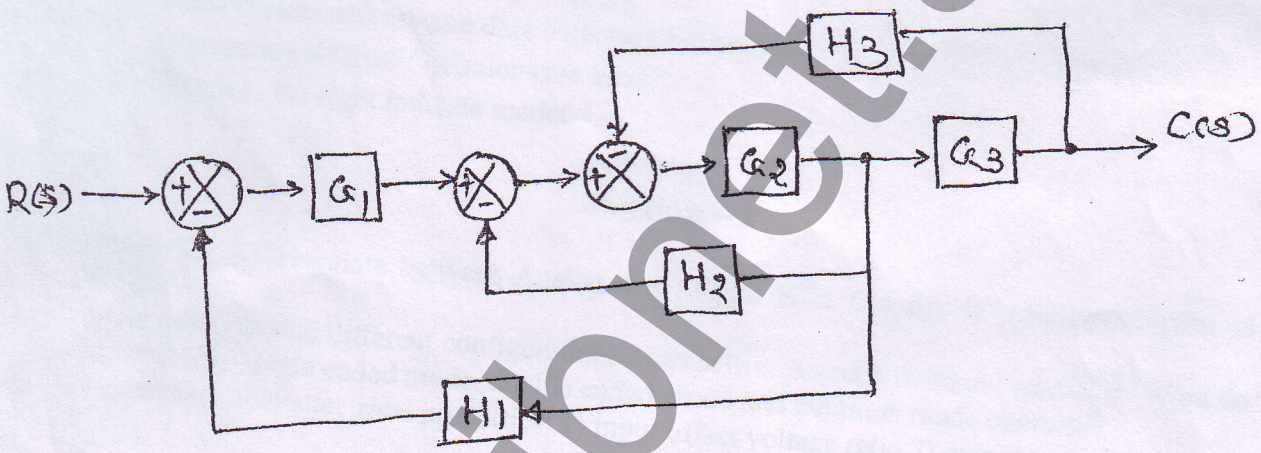
gnu.inflibnet.ac.in



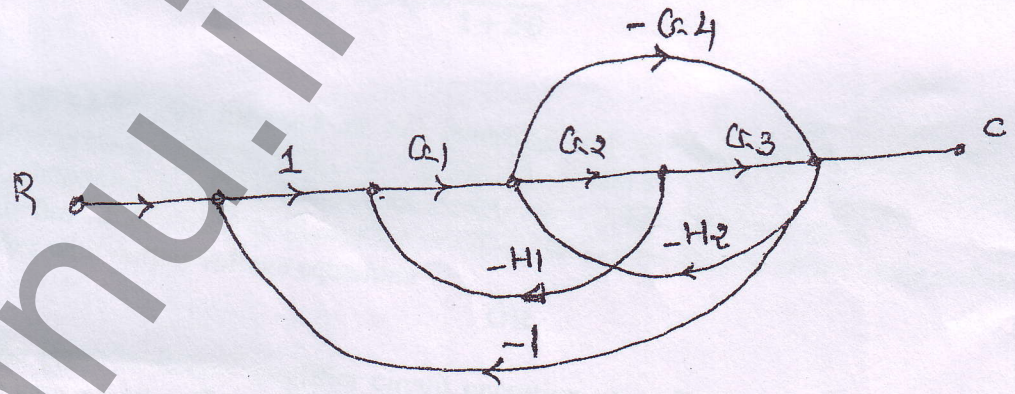
Que 1 as Fig. 1



Que 2 as Fig. 2



Que. 4 OR (b) Fig. 3.



Que 5 OR as Fig. 4.

gnu.inflibnet.ac.in