Sixth Semester B. Tech Degree Examination

Branch: Aeronautical Engineering

(Model Question Paper)

(2013 Scheme)

13.605: CONTROL SYSTEMS (S)

Time: 3 hours Max. Marks:100

PART A

Answer all questions. Each question carries 2 marks

1) Explain Altitude hold control system
2) Draw the block diagram of a closed loop control system and explain the advantages
3) State and explain Nyquist Stability Criterion
4) Explain force-voltage analogy with an example
5) Explain the significance of phase margin and gain margin
6) Define test signals. Mention any two with its graphical representation and give its Laplace transform
7) What is the effect of adding poles and zeroes on Root Locus?
8) What is a PID controller? Obtain its transfer function
9) Explain pitch displacement autopilot system
10) Explain Controllable canonical form and Observable Canonical form in state space representation

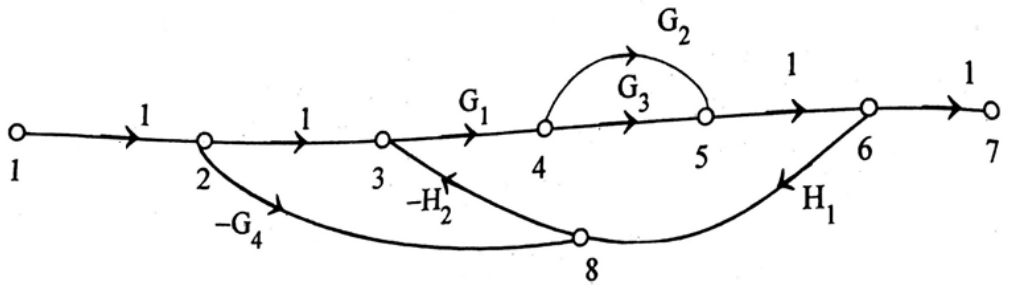
(10x2 = 20 marks)

PART B

Answer any one question from each module. Each question carries 20 marks

Module I

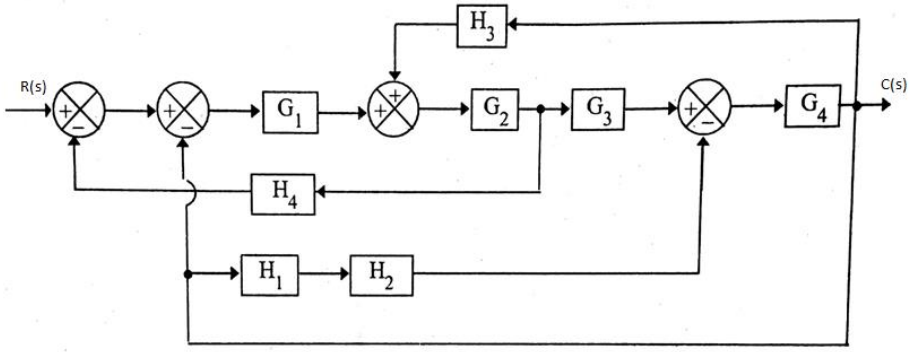
11) a) Explain Automatic Flight Control System with a neat block diagram **(10 marks)**
b) Draw a signal flow graph for the system shown below



(10 marks)

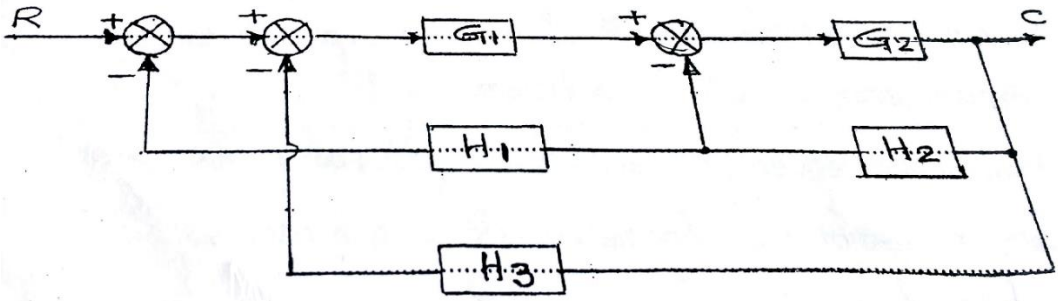
OR

12) a)By block diagram reduction technique, obtain the overall transfer function C(s)/R(s)



(10 marks)

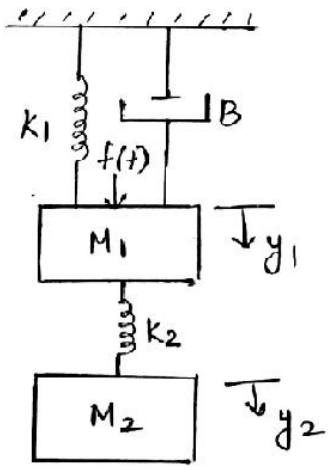
b) Using signal flow graph method, determine C/R of the control system shown below.



(10 marks)

Module II

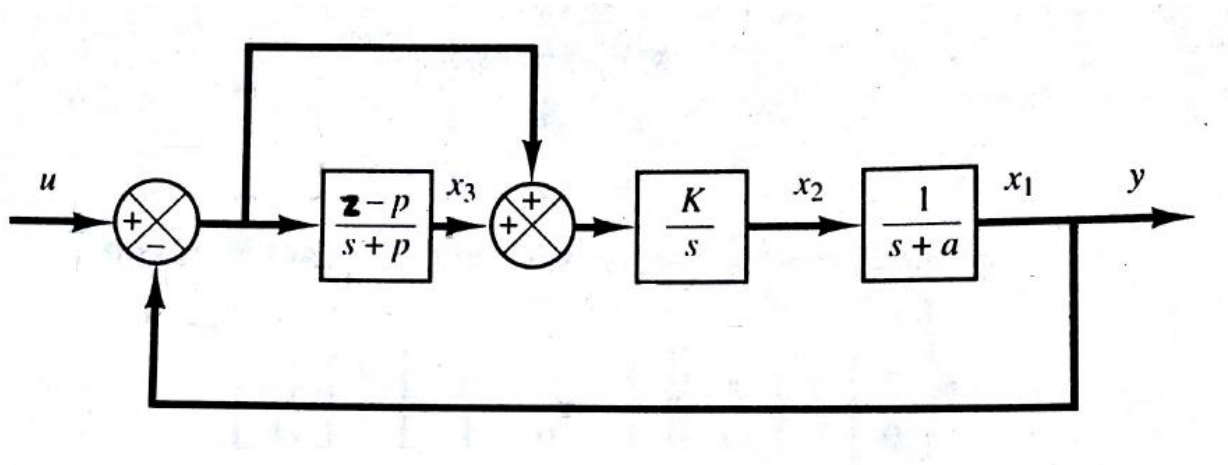
13) Evaluate the transfer function $Y_2(s)/F(s)$ of the system given below. Also draw the corresponding force-voltage analogy circuit



(20 marks)

OR

14) a) Obtain the state space representation of the system shown in figure



(10 marks)

b) Consider a linear system described by the transfer function Y(s)/U(s) = 10/(s(s+1)(s+2)). Obtain the state model of the system

(10 marks)

Module III

15) a) Explain PI controller in an Automatic Control System and mention the advantages

(5 marks)

b) For a unity feedback system, the open loop transfer function is given by

G(s) = 10(s+2)/(s^2(s+1))

Find

i) position, velocity and acceleration error constants

ii) the steady state error when the input is

R(s)= (3/s) –(2/s^2) + 1/(3s^3) **(15 marks)**

OR

16) a) Obtain the response of unity feedback system whose open loop transfer function is G(s)=4/(s(s+5)) when the input is unit step **(5 marks)**

b) Explain the time domain specifications.

(5 marks)

c)Obtain the response of a first order system to unit ramp input

(10 marks)

Module IV

17) a) The characteristic polynomial of a system is given by $s^4+s^3+2s^2+2s+3=0$. Determine the stability of the system **(5 marks)**

b) A unity feedback control system has an open loop transfer function $G(s) = k/(s(s^2+4s+13))$. Sketch the root locus for the system **(15 marks)**

OR

18) Draw the Bode plot for

$G(s) = 36(1+0.2s)/(s^2(1+0.05s)(1+0.01s))$

From the plot, determine Phase crossover frequency, Gain crossover frequency, Phase margin and Gain margin. **(20 marks)**

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