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Reg. No. : .....

Name : .....

Seventh Semester B.Tech. Degree Examination, May 2014
(2008 Scheme)
08.701 : CONTROL SYSTEMS (E)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. **(10×4=40 Marks)**

1. Explain the properties of transfer function.
2. Derive the transfer function of a transactional second order mechanical system.
3. Define node, loop, mixed node and forward path associated with signal flow graph.
4. What is the nature of unit step response of a closed loop system with unity feed back having open loop transfer function $G(s) = \frac{20}{s(s+10)}$?
5. Explain the operation of DC servo motor.
6. Find the value of k for which the unity feed back system $G(s) = \frac{k}{s(s+2)(s+4)}$ cross the imaginary axis.
7. Explain the performance specification of steady state response.
8. State and explain Nyquist stability criterion.
9. Derive the transfer function of electrical lead network.
10. Define control action and different types of controllers.

P.T.O.

PART – B

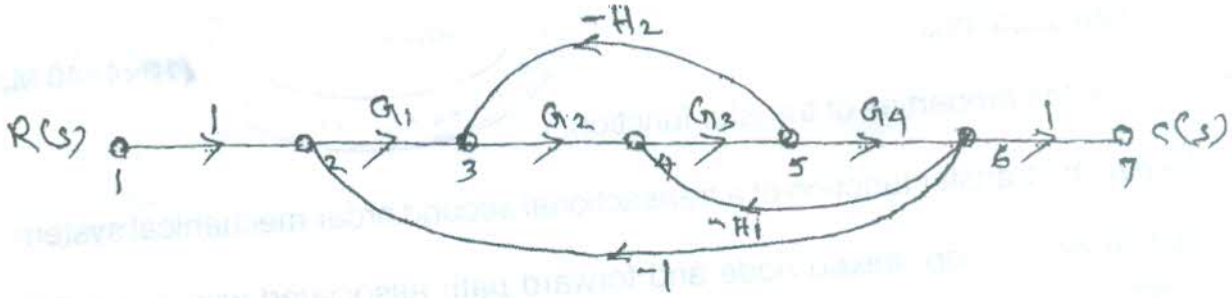
Answer **any one full** question from **each** Module.

Module – 1

11. a) State and explain Mason's gain formula. 5

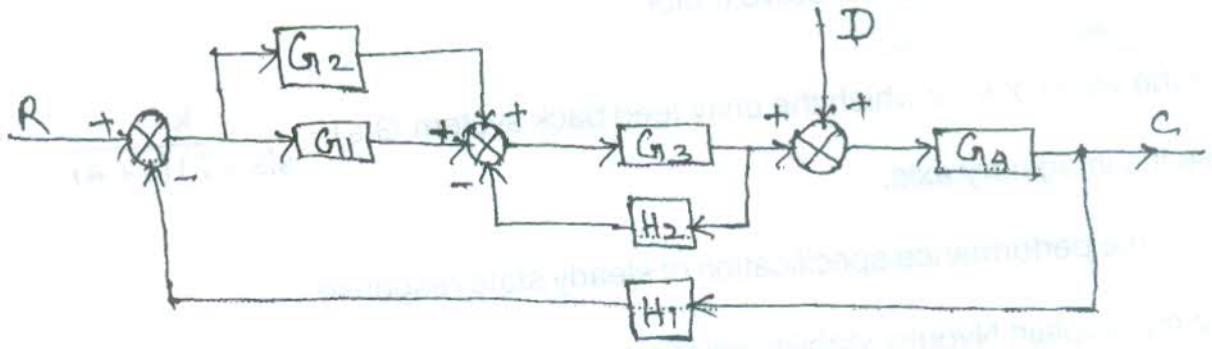
    b) Explain force-voltage analogy with example. 5

    c) Find the overall transfer function for the signal flow graph shown in figure. 10



12. a) What are the different components of an automatic control system and explain. 10

    b) Determine the ratio C/R, C/D and the total output for the system block diagram shown below 10



Module – 2

13. a) Explain the performance specification of time domain response of a second order system. 10

    b) Using Routh criterion determine the value of k for which the system with characteristic equation $s(s + 1)(s^2 + s + 1) + k = 0$ is stable. 10

14. a) Explain type of a system, different static and dynamic error co-efficients. 8

b) For a unity feed back system with open loop transfer function $G(s) = \frac{10(s+2)}{s^2(s+1)}$

find :

i) The position, velocity and acceleration error constants

ii) Steady state error for an input of

$$R(s) = \frac{3}{s} + \frac{1}{3s^3} - \frac{2}{s^2}.$$ 12

Module – 3

15. a) Plot the bode diagram for an open loop transfer of a system

$G(s)H(s) = \frac{50}{s(0.5s+1)(0.005s+1)}$. Obtain the gain margin and phase margin. 15

b) Define gain margin and phase margin. 5

16. a) Explain minimum and non-minimum phase system. 5

b) Sketch the Nyquist plot for a unity feed back system having the loop transfer function $G(s)H(s) = \frac{k}{s(s+1)(s+10)}$. Determine the range of k for the system to be stable. 15