Reg. No. : .....

Name : .....

Seventh Semester B.Tech. Degree Examination, June 2016
(2008 Scheme)
08.701 : CONTROL SYSTEMS (E)

Time: 3 Hours Max. Marks: 100

PART – A

Answer **all** questions.

1. Define transfer function of a system and state whether it is independent of the input of a system. Is it applicable to a non-linear system ?
2. Write down the torque-balance equation of an ideal rotational dash-pot and an ideal rotational spring.
3. What is meant by electrical zero and null position in a Synchro ?
4. List the time domain specifications and sketch the response of second-order under damped system.
5. Define step signal and a ramp signal in a control system.
6. What is meant by a characteristic equation ? How the roots of the characteristic equation are related to stability ?
7. Give the statement of Nyquist stability criterion.
8. State the advantages of Bode plot.
9. What is meant by a non-minimum transfer function ? In minimum phase system how the start and end of polar plot are identified.
10. Write the transfer function of a lead compensator and draw its Pole-Zero plot.

(10×4=40 Marks)

P.T.O.

PART – B

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

Module – 1

11. a) Using block diagram reduction technique find the closed loop transfer function of the system whose block diagram is shown in Fig. 1. **10**

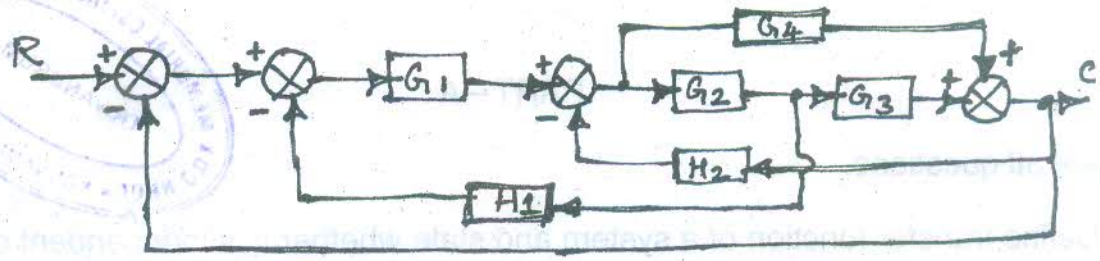

Fig. 1

b) Convert the block diagram into signal flow graph shown in Fig. 2 and determine the transfer function using Mason's gain formula. **10**

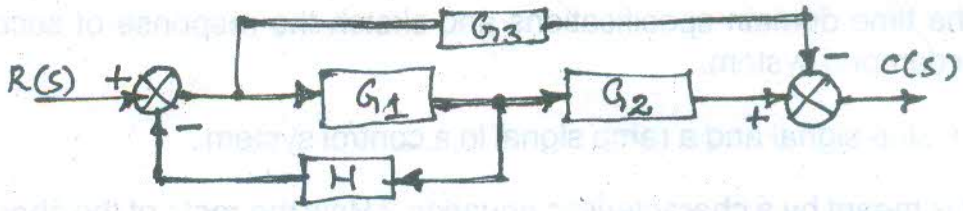

Fig. 2

12. Write a brief descriptive note on the following control system components.

i) DC Servo motor. **10**

ii) Stepper motor. **10**

Module – 2

13. a) A unity feedback system has an open-loop transfer function of $G(s) = 10/s(s + 2)$. Find the rise time, percentage overshoot, peak time and settling time for a step input of 12 units. **10**

b) A unity feedback system has an open-loop transfer function of $G(s) = 10/s(s + 1)(s + 2)$. Determine the steady state error for unit step input. 10

14. a) By Routh-Hurwitz criterion determine the stability of the system represented by the characteristic equation $9s^5 - 20s^4 + 10s^3 - s^2 - 9s - 10=0$. Comment on the location of the roots of the characteristic equation. 10

b) Outline in brief the procedural steps involved in the construction of root locus for the analysis of control systems ? 10

Module – 3

15. Sketch the magnitude and phase Bode plots for the following transfer function and hence determine the gain cross-over frequency, phase cross-over frequency, gain margin and phase margin of the system. Also comment on the stability of the system. 20

$$G(s) = \frac{20}{s(1+3s)(1+4s)}$$

16. For the following open-loop transfer function of a unity feedback system, sketch the polar plot and hence determine the gain and phase margin of the system. 20

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