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Reg. No. : .....

Name : .....

Sixth Semester B.Tech. Degree Examination, March 2015
(2008 Scheme)
08.603 : CONTROL SYSTEMS (T)
(Special Supplementary)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **4** marks.

1. Draw the block diagram of a closed loop system showing all components and explain.
2. Obtain the analogous quantities in force-voltage analogy.
3. State and explain Mason's gain formula.
4. What are the differed test signals ? Obtain their interrelationship.
5. Explain how gain margin and phase margin can be used to analyse stability of a system.
6. Distinguish between breakaway and breakin points.
7. Differentiate type and order of a system. Find the type and order of the system given by $G(s)\,H(s) = \frac{1}{s(s+1)}$.
8. Discuss the effect of adding a pole to the forward path transfer function.
9. How do you analyse stability in the Z-plane.
10. Define controllability and observability. **(10×4=40 Marks)**

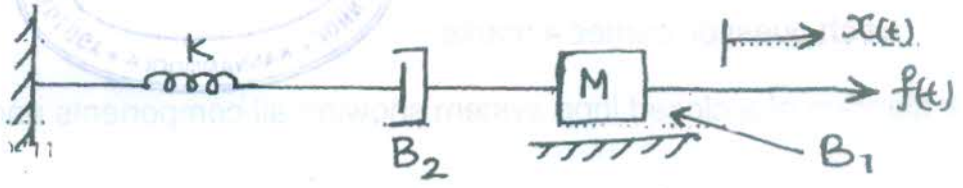
P.T.O.

PART – B

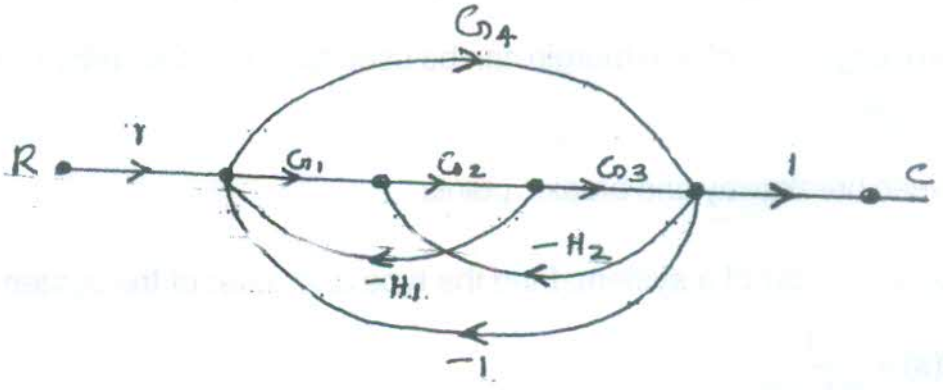
Answer **any two** questions from **each** Module.

Module – I

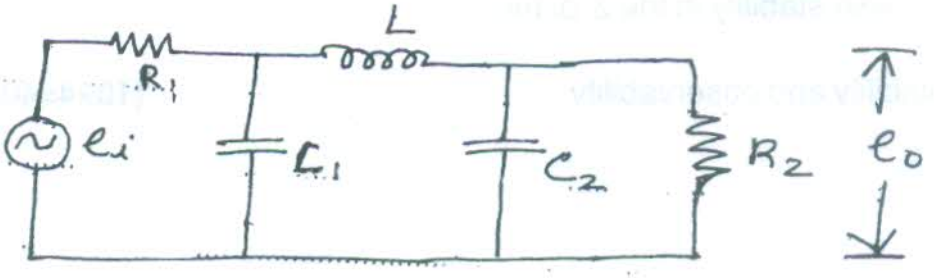
11. Write the equations of motion in S-domain for the system shown and determine the transfer function of the system.



12. Obtain the overall transfer function C/R from the signal flow graph shown below.



13. Represent the electrical circuit shown by state model.



Module – II

14. Sketch the Bode magnitude and phase plot for the transfer function given and hence determine the gain margin and phase margin $G(s) = \dfrac{10}{s(1+0.5s)(1+0.1s)}$.

15. Determine the stability of the system represented by the characteristic equation $s^4 + 8s^3 + 18s^2 + 16s + 5 = 0$ using Routh criterion and hence comment on the stability of the system.

16. Sketch the root locus of a feedback system whose open loop transfer function is given by

$$G(s) = H(s) = \frac{K}{s(s+2)(s+3)}.$$

Module – III

17. Check the observability and controllability of a system given by

$$X = \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix}, \quad A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \quad B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \quad C = [4 \quad 5 \quad 1].$$

18. State Jury's stability test and determine the stability of a sampled data control system given by

$F(z) = z^4 - 1.7\,z^3 + 1.04\,z^2 - 0.268z + 0.024.$

19. Given a system with $G(s) = \dfrac{K}{s(s+2)(s+20)}$. Design a lag compensator, given phase margin $\geq 35^\circ$ and $Kv \leq 20$.
