G 511 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Fourth Semester

Branch : Electrical and Electronics Engineering

EE 010 403—LINEAR SYSTEM ANALYSIS (EE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Classify between distributed and lumped parameter systems.
2. Define Mason's gain formula. What do you mean by Non-Touching loops ?
3. Compare between open loop and closed loop control systems.
4. Describe briefly the "Sylvester's Theorem".
5. What do you mean by driving point functions ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Derive the transfer function of armature controlled D.C. motor.
7. Draw the signal flow graph of the Mechanical system shown below (Fig. 1)

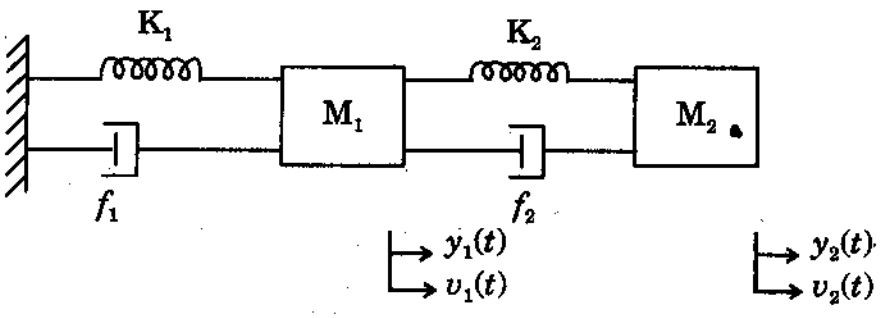


Fig. 1

Turn over

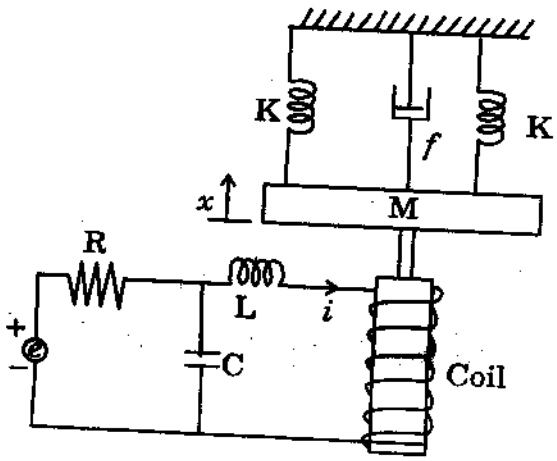
8. Discuss the response of first order system to unit step, unit ramp and unit impulse signals.
9. Describe Routh-Hurwitz criterion.
10. What is the difference between driving point functions and transfer functions.

(5 × 5 = 25 marks)

Part C

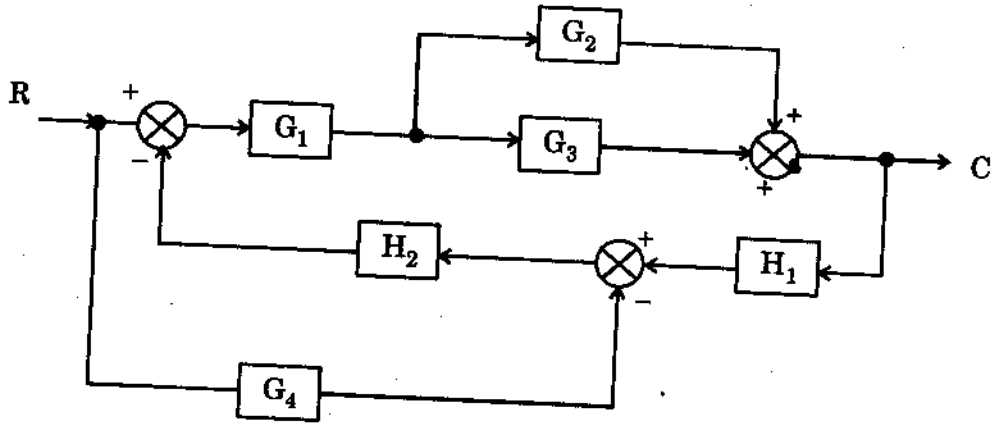
Answer **all** *questions.*
Each question carries 12 *marks.*

11. Find the transfer function $X(s)/E(s)$ for the electro-mechanical system shown below (Fig. 2)



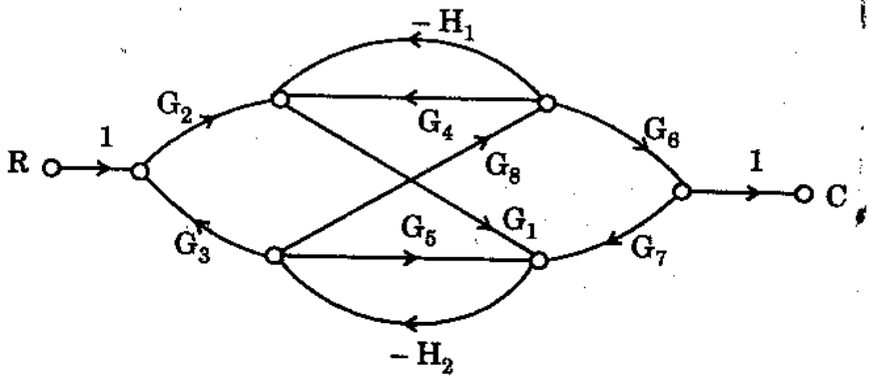
Or

12. Discuss about the mathematical modeling of electro-mechanical, translational and rotational systems.
13. Draw a signal flow graph and evaluate the closed loop transfer function of a system whose blockdiagram is given below :

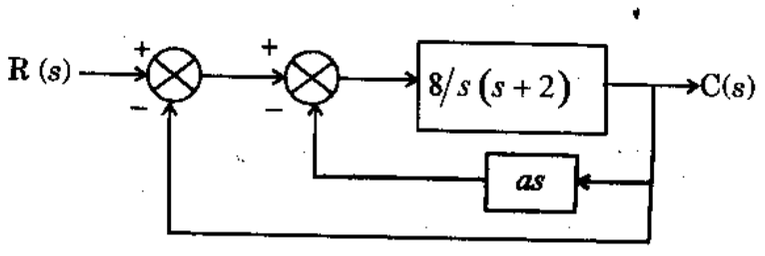


Or

14. Obtain the overall transfer function C/R from the signal flow graph shown in figure below :



15. Consider the control system shown below :



(a) In the absence of derivative feedback (a = 0), determine the damping factor and natural frequency. Also determine the steady state error resulting from a unit ramp input.

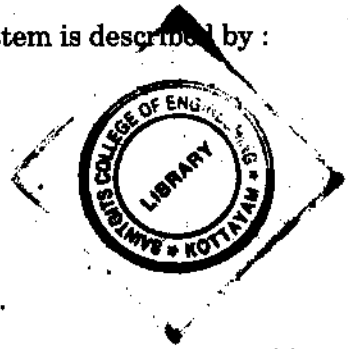
(b) Determine the derivative feedback constant of which will increase the damping factor of the system to 0.7. What is the steady-state error to unit ramp input with this setting of the derivative feedback constant ?

Or

16. The overall transfer function of a unity feedback system is given by $C(s)/R(s) = \left[10/\left(s^2 + 6s + 10\right)\right]$. Find the values of the static error constants. Also determine the steady state error for the input $r(t) = 1 + t + t^2$.

17. The state-variable model of open-loop system is described by :

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -3 & 2 \end{bmatrix}; B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$



(a) Check the stability of the system.

(b) The system's loop is now closed by a state feedback $u(t) = -K x(t)$.

Where $K = [K_1, K_2, K_3]$ is the feedback matrix of constant gains. Determine the constraints on the elements of K for the system to be stable.

Or

18. State Lyapunov's theorem. Compare Direct and Indirect methods of Lyapunov's theorem. Explain stability analysis using Lyapunov's direct method.

19. Write notes on the following :—

(a) Inverse (*g'*) parameters.

(b) Gyrator.

(c) Transmission (ABCD) parameters.

Or

20. Write notes on the following :—

(a) Ideal transformer.

(b) Impedance converter.

(c) Hybrid (*g*) parameters.

(5 × 12 = 60 marks)