Code No. : 5144/ S

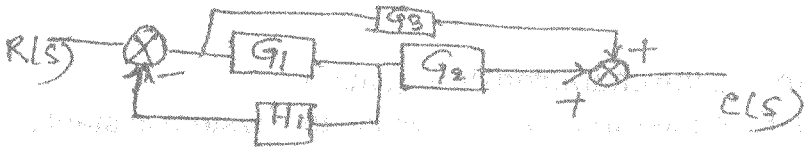
FACULTY OF ENGINEERING
B.E. 3/4 (ECE) I Sem. (Suppl.) Examination, July 2012
AUTOMATIC CONTROL SYSTEMS

Time: 3 Hours] [Max. Marks: 75

Note : *Answer **all** questions from Part **A**. Answer **five** questions from Part **B**.*

PART – A **(25 Marks)**

1. Write the advantages of a synchro.
2. Find C(s) /R (s) of the block diagram shown in figure.



3. Differentiate between Routh stability criterion and Nyquist criterion.
4. Sketch the Root locus of (S+1) /(S+2).
5. Find the gain cross over frequency of 10/[S (S+2)].
6. Why lag and lead are called compensating networks ?
7. Write the disadvantages of digital control system.
8. Write the merits and bode plots over Nyquist criterion.
9. Write the properties of state transition matrix.
10. Define state controllability.

(This paper contains 2 pages)

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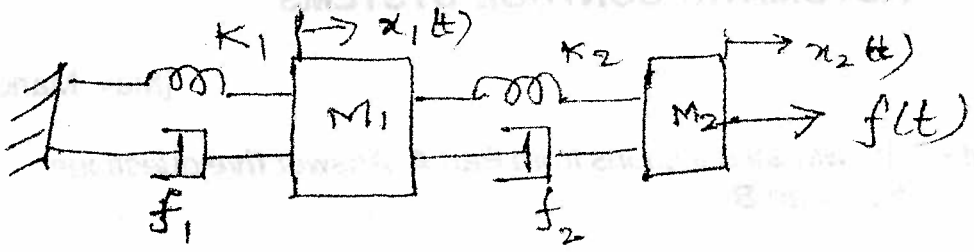
PART – B (50 Marks)

11. For mechanical system given below find its transfer function and also find its equivalent electrical circuit using force-voltage analogy.



12. a) What are the specifications of a 2nd order system ?
    b) For unit step input sketch the output response of a 2nd order system for different damping factors
        i) between 0 and 1
        ii) greater than one and
        iii) equal to zero.

13. Consider a third order system has the characteristic equation $S^3 + 3KS^2 + (K+2)S + 4 = 0$. Find the range of K for which the system is stable using Routh Herwitz criterion.

14. Sketch the root locus of a system whose system transfer function is K/[S(S+2) (S+4)] and show all the calculations.

15. Sketch the Bode plots of a given system $G(S) = \frac{20}{S(S+2)(S+10)}$. Calculate the gain crossover frequency.

16. The state equations of a linear time invariant system are represented by

    $\dot{X} = A\,x(t) + B\,u(t)$. Find the state transition matrix $\phi(t)$ for

    $A = \begin{bmatrix} 0 & 1 \\ -4 & -5 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$.

17. Write short notes on the following :
    a) The Discrete transfer function
    b) PID controller
    c) Architecture of Digital control system.