Code No. : **5088**

FACULTY OF ENGINEERING

B.E. 3/4 (E&EE/Inst.) I Sem. (Main) Examination, December 2011/January 2012

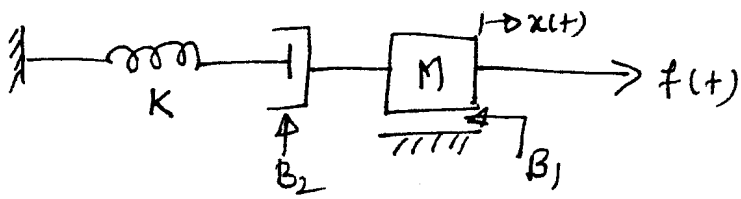
LINEAR CONTROL SYSTEMS

Time: 3 Hours] [Max. Marks: 75

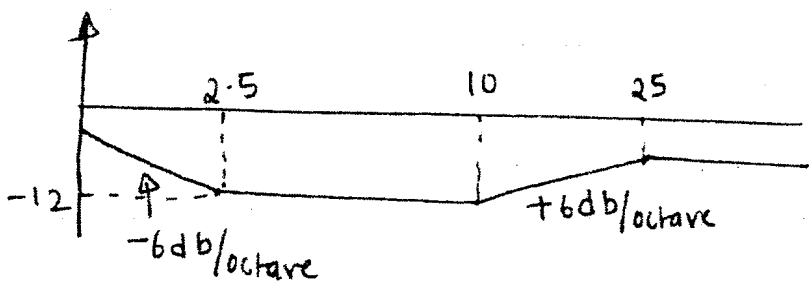
Note : *Answer* ***all*** *questions from Part* ***A****. Answer* ***any five*** *questions from Part* ***B****.*

PART – A **(25 Marks)**

1. Define Mason's gain formula. **2**
2. Draw the force-voltage analogus circuit for the system given below **3**



3. A unity feedback system has open loop transfer function $G(s) = \frac{25}{s(s+6)}$. Find the time t_p at which the peak of the step input response occurs. **3**
4. What are the effects of I controller and D controller ? **2**
5. Write frequency domain specifications. **2**
6. Find the transfer function of the given Bode plot. **3**



7. Define state. How to choose state variables ? **2**

8. $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$. Determine state transition matrix e^{st}. 3

9. Define sampling theorem. 2

10. Determine z-transform of $e^{-at}u(t)$. 3

PART – B (50 Marks)

11. a) Explain the principle and working of synchro. 5

b) Determine the mathematical model of the mechanical system shown in Fig. 2.

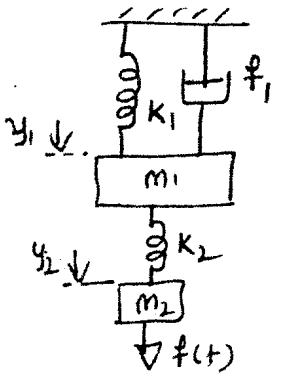


Fig. 2 5

12. a) Determine the overall transfer function. C/R (s) for the system shown in Fig. 3.

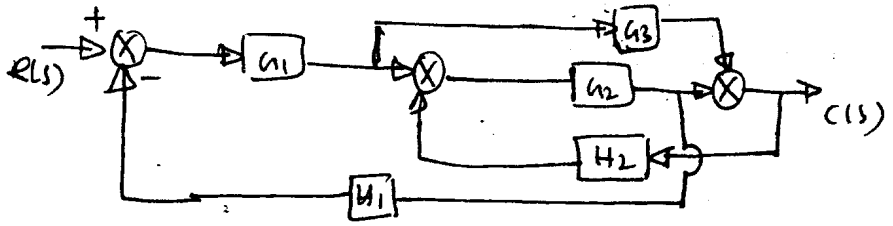


Fig. 3 6

b) Write the difference between open loop system and closed loop system with examples. 4

13. Sketch the root locus of the system whose transfer function is

$$G(s) = \frac{k}{s(s^2 + 4s + 13)}.$$ 10

14. Draw the Bode plot of the unity feedback control system, whose open loop transfer function is $G(s) = \frac{100}{s(1+0.1s)(1+0.2s)}$. Also determine the gain margin, phase margin and stability. **10**

15. Determine controllable canonical form, observable canonical form and diagonal form for the following transfer function $G(s) = \frac{4(s+1)}{(s+2)(s+4)(s+6)}$. **10**

16. a) Explain Jury's stability criterion **5**

    b) Write properties of 2-transform. **5**

17. Write short notes on :

    a) Nyquist stability criterion **5**

    b) Relation between s-domain and z domain. **5**