Code No: NR411503 **NR**

IV B.Tech I Semester Supplementary Examinations, November 2005
CONTROL ENGINEERING
(Computer Science & Systems Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Write the differential equation governing the behaviour of the mechanical system shown in Figure1. Also obtain an analogous circuit based on force voltage analogy. [16]

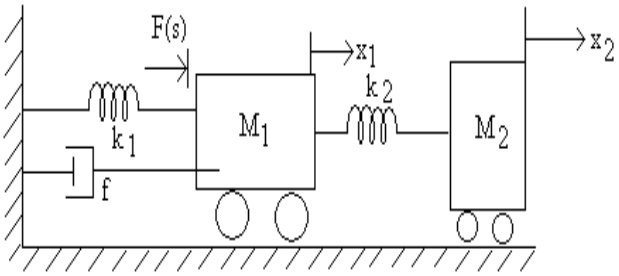

Figure 1:

2. Find $\frac{C(s)}{R(s)}$ for the system shown in Figure 2 by blockdiagram reduction technique. [16]

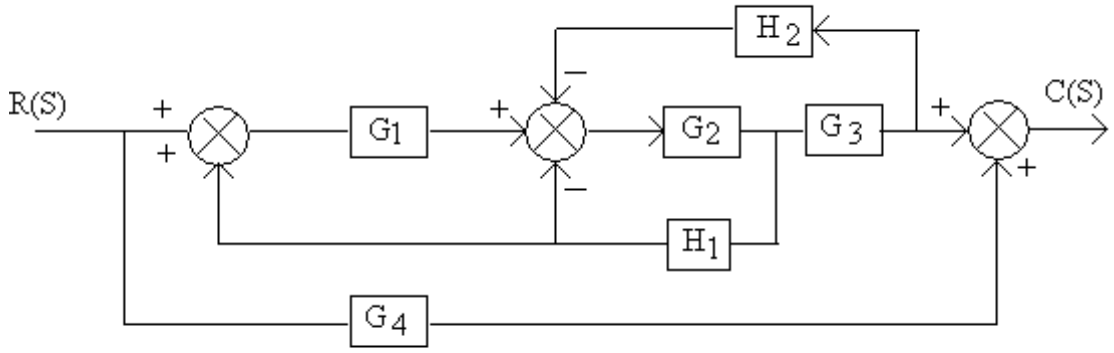

Figure 2:

3. Obtain the transfer function of two Phase. A.C. Servomotor. [16]

4. The open loop T.F. of a unity F.B. system

(a) is given by $G(S) = \frac{K}{S(TS+1)}$ where K and T are positive constants. By what factor should the amplifier gain be reduced so that the peak over shoot of unit step response of the system is reduced from 75% to 25%. [9]

(b) a unity feed back system is characterised by the open loop T.F. $G(S) = \frac{K[S+13]}{S(S+3)(S+7)}$ Using Routh criterion calculate the range of 'K' for the system to be stable. [7]

5. For $G(S) = \frac{K}{S(S+2)(S+20)}$ Design a Lag compensator, given phase margin $\geq 35^{o}$ and $k_V \leq 20$. [16]

6. (a) Obtain two differential state representation for the system with transfer function. $\frac{C(S)}{U(S)} = \frac{2}{S^3+6S^2+11S+6}$. [10]

(b) Define the properties of state transition matrix. [6]

7. (a) The open loop T.F of a unity Feed back system is $G(S).H(S) = \frac{K(S+3)}{S+(S-1)}$: Comment on the stability. [8]

(b) State Nyquist stability criterion. [8]

8. Sketch the Bode Plot for the following transfer function and determine the gain cross over frequency $G(S) = \frac{10}{S(1+0.5S)(1+0.25S)}$. [16]

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