No. of Printed Pages : **4**

BIEE-021

B.Tech. IN ELECTRICAL ENGINEERING

Term-End Examination

June, 2013

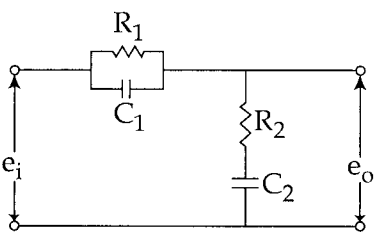
BIEE-021 : CONTROL SYSTEM

01501

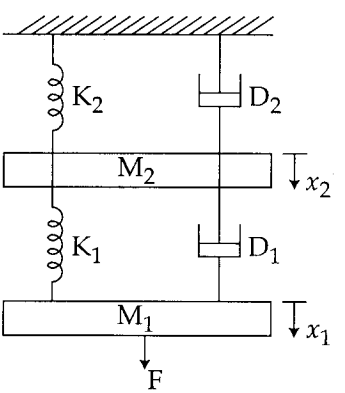
Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any five** question. Each question carry **equal** marks. Need graph paper.*

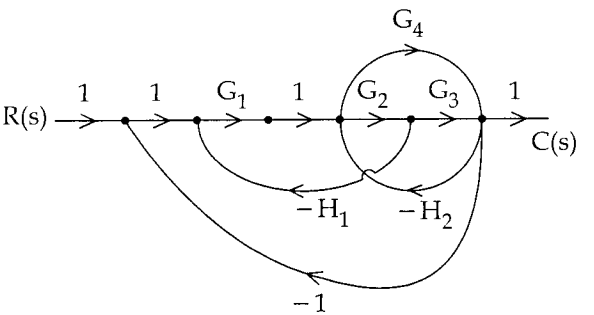
1. (a) Find tranfer function of the circuit : 7



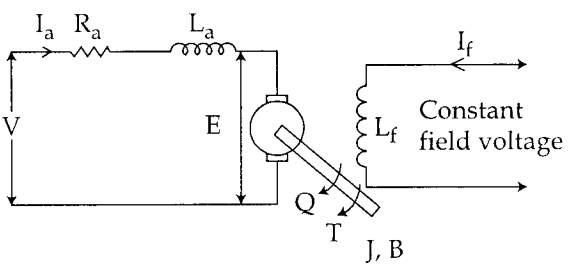
(b) Obtain the differential equations describing the mechanical system shown in figure, and draw the electric network using Force-voltage analogy. 7



2. (a) Find the transfer function C(s)/R(c) for the signal flow graph. 7



(b) Derive the Transfer function of Armature controlled DC motor. 7



3. (a) An unity feedback system has a loop tranfer function $G(s) = \frac{10(s+1)}{s(s+2)(s+5)}$ 7

(i) step, ramp, Parabolic error coefficient

(ii) e_{ss} when $r(t) = 3 + 10t$

(b) A unity feedback system with a forward transfer function $G(s) = \frac{k}{s(s+7)}$ is operating with a closed loop response that has 15% overshoot. Find : 7

(i) Settling time

(ii) Peak time

4. Consider the system G(s) with unity feedback having transfer function $G(s) = \frac{10}{s(s+1)}$. Design a compensator such that closed loop system will satisfy following requirements. 14

(a) Static velocity error constant = 20sec^{-1}

(b) Phase margin = 50°

(c) Gain margin $\geq$ 10 dB.

5. Consider a matrix A given below find the eigen values, eigen vector, modal matrix and diagonalise it. 14

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 3 & 0 & 2 \\ -12 & -7 & -6 \end{bmatrix}$$

6. Write short notes on following : 7x2

(a) Frequency domain specifications.

(b) Servo motors.

7. (a) The characteristics equation of a feedback system is : 7

$$F(s) = s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16.$$

Using the Routh's criterion determine the stability of the system and frequency of oscillation.

(b) Draw the root locus for the system 7

$$G(s)\,H(s) = \frac{k}{s(s+3)(s+6)}$$

Determine the value of k for marginal stability.

8. A unity feedback system has open loop Transfer function $G(s) = \frac{1}{s(1+2s)(1+s)}$ 14

Sketch Nyquist plot for the system and therefore obtain gain margin and phase margin.