M 23317

Reg. No. : ....

Name : ....

VI Semester B.Tech. Degree (Reg./Sup./Imp. – Including – Part-Time) Examination, May 2013
(2007 Admn. Onwards)
PT 2K6/2K6 EC/AEI 606(C) : LINEAR SYSTEM ANALYSIS

Time: 3 Hours   Max. Marks: 100

I. a) Define system and sub-system. Give examples.

  b) Differentiate between linear and non-linear control system.

  c) Write short notes on thermal systems.

  d) What is the difference between D'Alembert's principle and Newton's second law of motion.

  e) What are the assumptions made during the derivation of Laplace transform.

  f) State Diachle's condition.

  g) How the roots of characteristic equations are related to stability with reference to Routh criteria.

  h) Explain state, state variable, state equation and state model.   **(8×5=40)**

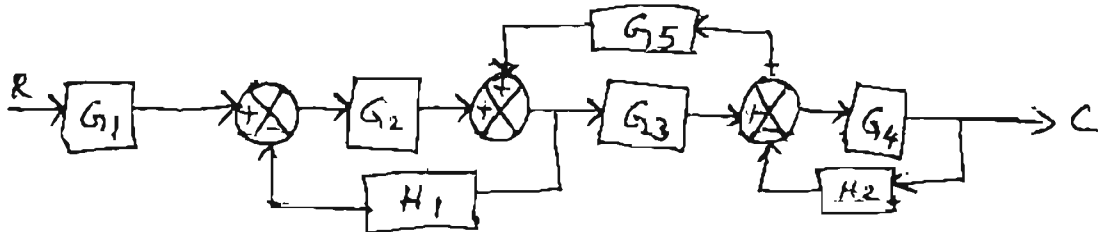II. a) Draw the translational and rotational mechanical analogous system of the following circuit.
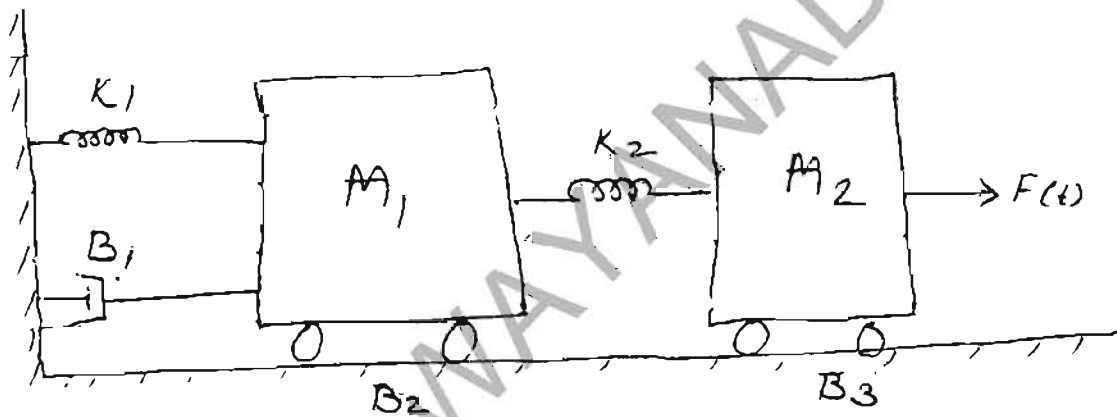

OR
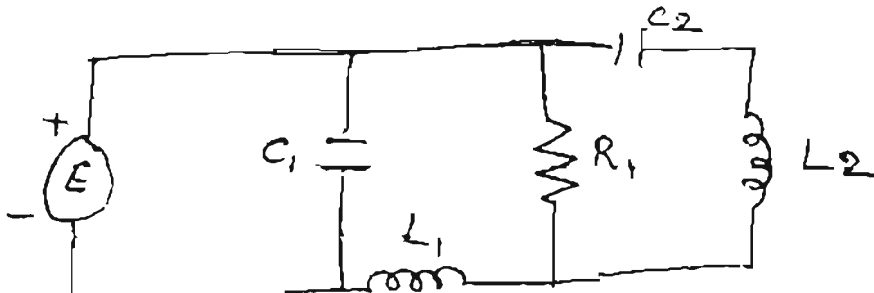
b) Obtain the signal flow graph and find the transfer function by Mason's gain formula.

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III. a) Obtain the dynamic equation of a system shown

OR

b) Differentiate between :

i) Hydraulic capacitance and hydraulic resistance

ii) Thermal capacitance and thermal resistance

iii) Pneumatic capacitance an pneumatic resistance.   15

IV. a) How Fourier transform related to Laplace transfer ? What is the advantage of Laplace over Fourier ? Also give the spectral properties of signals.

OR

b) A second order control system is represented by a transfer function

$$\frac{\theta(S)}{T(S)} = \frac{1}{JS^2 + FS + K} \text{ where } \begin{array}{l} \theta \to \text{Output} \\ T \to \text{Input torque} \end{array}$$

A step input of 10 NM is applied to the system and test results are given below :

1) $\mu p = 6\%$

2) $tp = 1$ sec

3) steady state value of out put is 0.5 rad.

Find the value of J, F and K. **15**

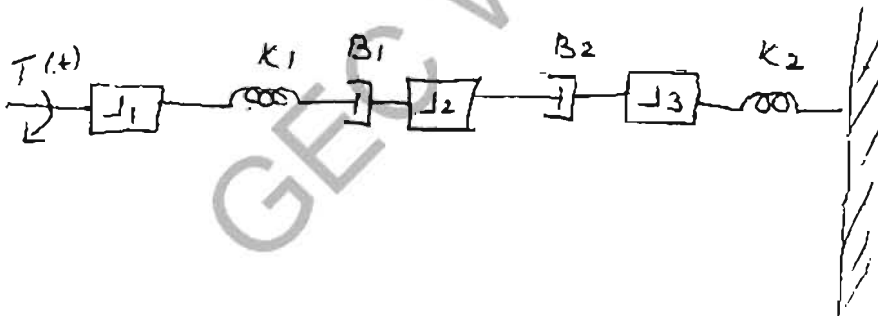V. a) Consider the system described the equations.

$x_1 (k + 1) = 2x_1 (k) + 0.5 x_2 (k) - 5$

$x_2 (k_1 + 1) = 0.8 x_2 (k) + 2$

Investigate the stability of the equilibrium state. Use the direct method of Lyapunov.

OR

b) Obtain the state space model for the system.

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