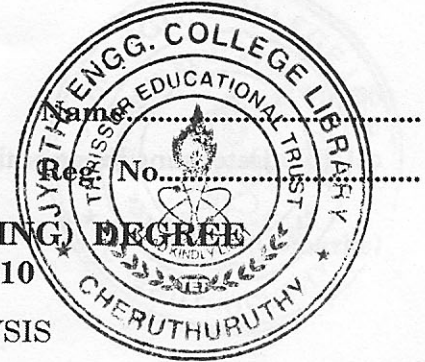


C 15296

(Pages 3)



FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE  
EXAMINATION, DECEMBER 2010

EE 2K 402—LINEAR SYSTEM ANALYSIS

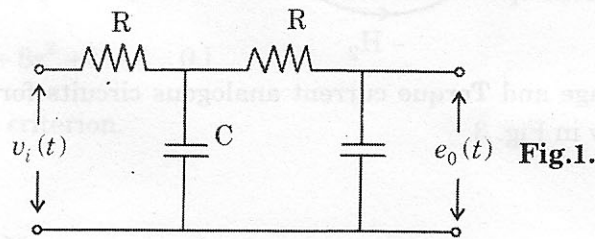
Time : Three Hours

Maximum : 100 Marks

Part A

Answer all questions.

- I. (a) Draw the signal flow graph of the network given below in Fig.1.



- (b) Distinguish between linear and non-linear systems.  
(c) Derive the transfer function of a pneumatic system.  
(d) Define thermal resistance and thermal capacitance.  
(e) State the properties of Fourier transform.  
(f) Find the static error coefficients for the open loop transfer function  $G(s)H(s) = \frac{10(s+2)}{s^2(s+1)}$ .  
(g) What is Asymptotic stability ?  
(h) Obtain the state model for the system given by  $\frac{C(s)}{R(s)} = \frac{10(s+4)}{s(s+1)(s+3)}$  using parallel decomposition.

(8 × 5 = 40 marks)

Part B

- II. (a) Explain the various classifications of systems with suitable examples.

Or

Turn over

- (b) Determine the overall transfer function using signal flow graph reduction technique.

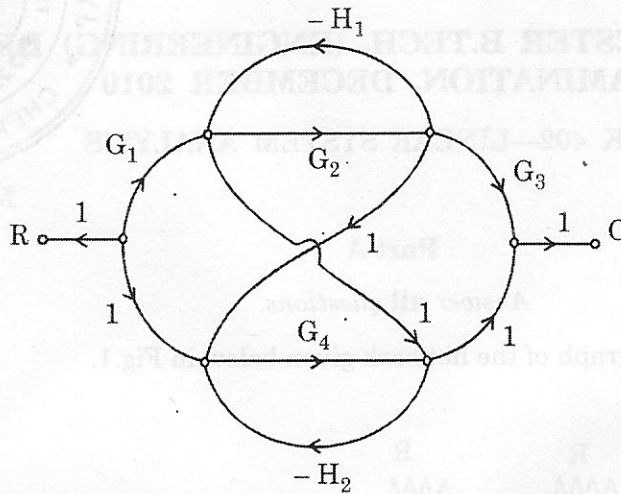


Fig. 2.

- III. (a) Draw Torque voltage and Torque current analogous circuits for the mechanical rotational system given below in Fig. 3.

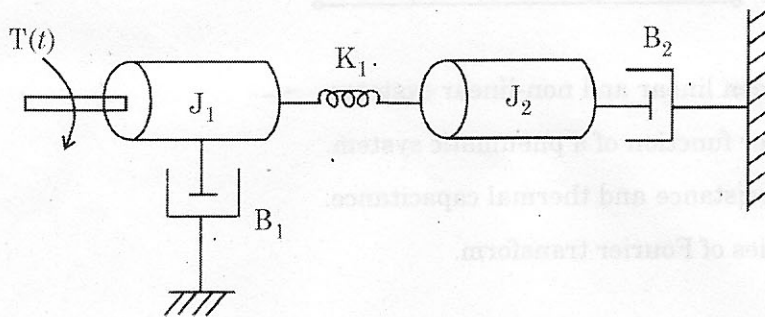


Fig. 3.

Or

- (b) Explain working principle of a hydraulic system.

- IV. (a) Derive an expression for rise time, settling time and peak overshoot of a second order underdamped system.

Or

- (b) (i) Determine the Fourier transform for the following functions :—

$$f(t) = e^{-at^2}$$

$$f(t) = t^2 e^{-2t} u(t).$$

(8 marks)

- (ii) Derive time response of a first order system when subjected to unit ramp input. Also compute steady state error.

- V. (a) Determine time response for  $\dot{X} = AX + Bu$  and  $y = CX$  where :

$$A = \begin{bmatrix} 1 & 4 \\ -2 & -5 \end{bmatrix}, x(0) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}, B = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \text{ and } C = [1 \quad 0].$$

Assume  $u$  as unit step input.

Or

- (b) Determine the stability of a system whose characteristic equation is :

$$s^5 + 4s^4 + 2s^3 + 8s^2 + s + 4 = 0.]$$

use Routh Hurwitz criterion.

[4 × 15 = 60 marks]

