

TEE-502

111

Printed Pages : 4

Roll No. to be filled in your Answer Book

Roll No.

Semester: V  
B.Tech Examination (2014-2015)  
SYSTEM ENGGINERING

Time: 3 Hours

MM. 100

Note:- Attempt All Questions. All Questions carry equal marks.

Q1. Attempt any four Questions of the following:-  $4 \times 5 = 20$

a. Draw F-I analog system for the following figure 1.

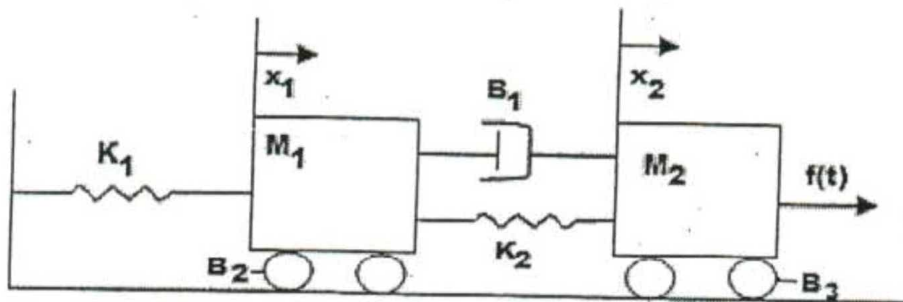


Figure . 1

b. Find C/R using reduction techniques in figure 2.

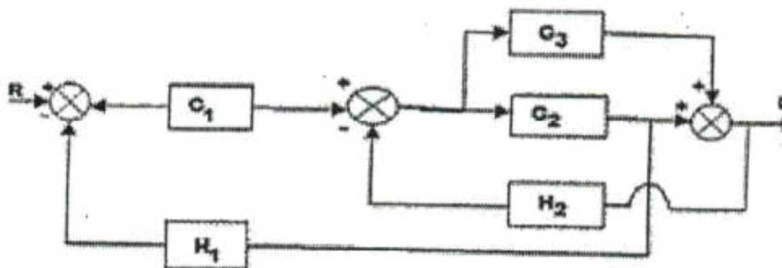


Figure . 2

(1)

- c. List the advantages and disadvantages of a closed loop system.
- d. Discuss the term transient response and steady state response with suitable diagram.
- e. Write the analogous electrical equations and elements in force voltage and force current for mechanical translational system.
- f. Explain the significance of the following aspects in designing control systems
  - (i) Stability
  - (ii) Disturbance rejection
  - (iii) Sensitivity and Robustness.

**Q2.** Attempt any four Questions of the following:-  $4 \times 5 = 20$

- a. Explain lag-lead compensation for a linear control system.
- b. For the electrical circuit shown in Fig.3 find the transfer function

function  $\frac{E_o(s)}{E_i(s)}$

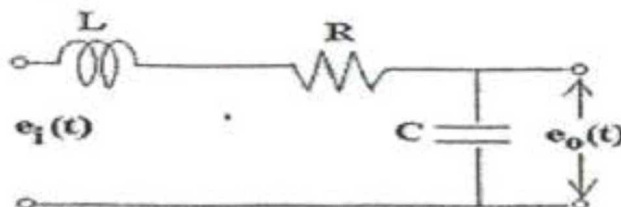


Figure 3.

- c. Discuss tuning of PID controller.
- d. Develop the signal flow graph and determine the overall transfer function of the given system in the figure 4. below using Mason's Gain formula

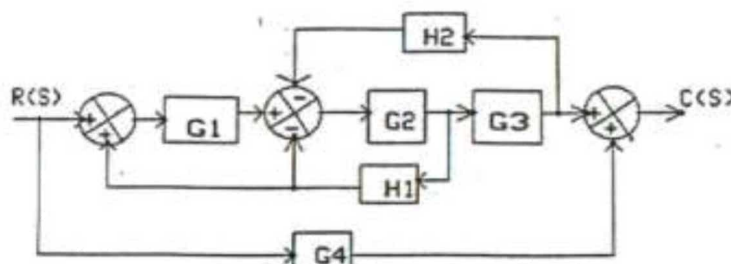


Figure 4.

- e. Consider a feedback control system with a disturbance input. Show that feedback reduces the effect of disturbance on the controlled output.
- f. What is Control System & Give the main classification of control systems?

**Q3.** Attempt any two parts of the following  $2 \times 10 = 20$

- a. Consider the mechanical system of figure.5 Obtain the transfer

function  $G(s) = \frac{X(s)}{F(s)}$ , assuming zero initial conditions. Draw the corresponding electric network using the force-voltage analogy.

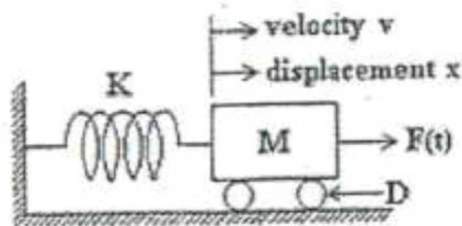


Figure 5.

- b. Explain sampling theorem and sample and hold.
- c. Explain stability analysis of sampled data control system with suitable examples.

**Q4.** Attempt any two parts of the following  $2 \times 10 = 20$

- a. What is the purpose of linearization? What is the process of linearization of a non linearization system model?
- b. Explain canonical variable diagonalization

- c. Obtain the transfer function for the lead compensator network of figure.6 in terms of the system time constant  $\tau = CR_1$  and  $\alpha = \frac{R_2}{R_1 + R_2}$ . Draw the pole-zero plot of the transfer function.

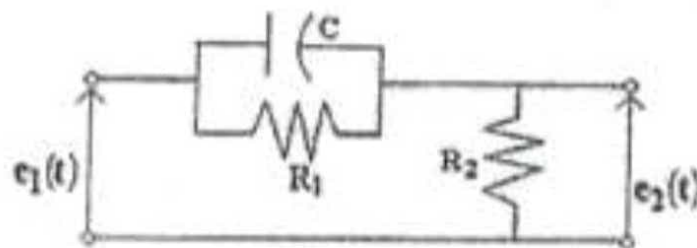


Figure 6.

- Q5. Attempt any two parts of the following  $2 \times 10 = 20$
- a. What is the Popov's stability Criteria? Explain with examples?
- b. Find out state equation from the given transfer function

$$\frac{Y(s)}{U(s)} = \frac{s^2 + 3s + 9}{5s^5 + 8s^4 + 24s^3 + 34s^2 + 23s + 6}$$

- c. what is the significance of Lyapunov function with respect to the stability concept?