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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(Automation &amp; Robotics) (2011 &amp; Onward) (Sem.-4)

**LINEAR CONTROL SYSTEMS**

Subject Code : BTEE-402

M.Code : 57108

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTIONS TO CANDIDATES :**

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

**SECTION-A****Q1. Write briefly :**

- a. What do you mean by plant and system? Explain.
- b. List the mechanical and electrical analogies.
- c. Explain how the pole zero locations effect the stability of the system.
- d. Explain the step and impulse test input signals.
- e. List the advantages and disadvantages of root locus technique.
- f. What do you mean by relative stability? Explain.
- g. Discuss the need of compensation.
- h. List the main characteristics of servomotors.
- i. Define state and state vector.
- j. What is Controllability and Observability of a system?

**SECTION-B****Q2. Explain the following in detail with suitable examples**

- a. Open and closed loop systems
- b. Continuous and sampled data control systems



- Q3. What is the need of signal flow graphs? List the different rules to draw the signal flow graphs. Determine the overall transmittance relating  $x_2$  and  $x_1$  for the signal flow graph shown below

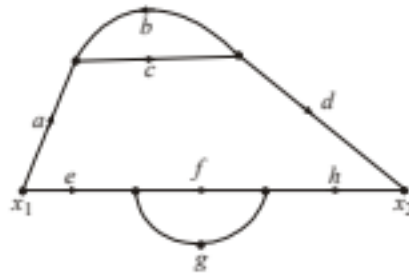


Fig.1

- Q4. Using the Routh-Hurwitz criterion determine the relation between  $K$  and  $T$  so that unity feedback control system having open loop transfer function  $G(s)H(s) = \frac{K}{s[s(s+10)+T]}$  is stable.
- Q5. The open loop transfer function of a system is given by  $G(s)H(s) = \frac{K}{s(sT-1)}$  of the system using Nyquist Criterion.
- Q6. Explain the different steps required to draw a root locus.

### SECTION-C

- Q7. Discuss the following :
- Tachogenerators
  - Series and parallel compensators
- Q8. Sketch the Bode plot for the transfer function given below :

$$G(s)H(s) = \frac{48(s+10)}{s(s+20)(s^2+2.4s+16)}$$

Apply correction to magnitude plot for the quadratic term and comment on the stability.

- Q9. Find controllability and observability of given system :

$$\begin{bmatrix} \dot{x}^1 \\ \dot{x}^2 \\ \dot{x}^3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \begin{bmatrix} x^1 \\ x^2 \\ x^3 \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} u(t)$$

$$y = \begin{bmatrix} 10 & 5 & 1 \end{bmatrix} \begin{bmatrix} x^1 \\ x^2 \\ x^3 \end{bmatrix}$$

**NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.**