

II B. Tech II Semester Regular Examinations, August/September - 2021

LINEAR CONTROL SYSTEMS

(Electronics Communication Engineering)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions one Question from each unit

All Questions carry **Equal** Marks

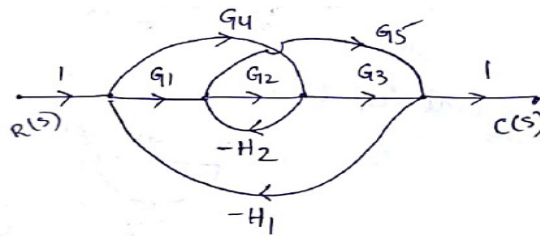
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- 1 a) Classify the control system types and discuss elaborately on their characteristics, advantages and disadvantages. [8M]  
 b) How to describe the behavior of a system using State Variable Descriptions. [7M]  
 Explain with an example.

Or

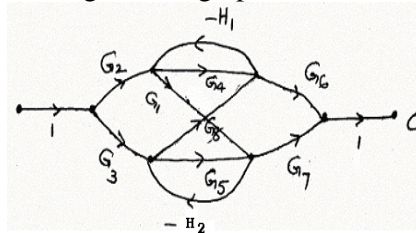
- 2 a) Illustrate the differential equation of an electrical system and obtain the Transfer function of a Linear Time Invariant (LTI) system [8M]  
 b) Explain about numerical control systems. [7M]

- 3 a) Derive the response of second order system with unit step response. [7M]  
 b) Obtain the overall transfer functions for the following signal flow graphs using mason's gain formula. [8M]



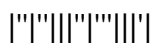
Or

- 4 a) Describe the various characteristics of Synchrotransmitter and receiver? [6M]  
 b) Discuss Mason's gain formula. Obtain the overall transfer function  $C/R$  from the signal flow graph shown. [9M]



- 5 a) Construct Routh array and determine the stability of the system whose characteristic equation is  $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$ . [8M]  
 b) Explain the procedure to draw root locus of a given transfer function. [7M]

Or



- 6 a) Choose the value of 'K' for the open loop transfer function [10M]  
 $G(s) = \frac{K}{(s+2)(s^2+4s+5)}, H(s) = 1$  For the system to be stable using R-H criteria.
- b) What are the disadvantages of Routh Criterion? [5M]
- 7 a) Given the open loop transfer function  $G(s) = \frac{5}{(1+2s+s^2)(1+3s)}$ . Sketch the [10M]  
 Nyquist plot and investigate the open loop and closed loop systems stability.
- b) List the advantages and limitations of Frequency response methods. [5M]
- Or
- 8 a) Given the open loop transfer function with unity feedback as [8M]  
 $G(S) = \frac{Ke^{-10s}}{s(2+s)(1+5s)}$ . Draw the bode plot and determine the gain K for the gain cross over frequency to be 4rad/sec.
- b) Sketch the polar plot and discuss the stability of the system represented by [7M]  
 $G(s)H(s) = \frac{K}{s(s+1)(s+5)}$ .
- 9 a) State and explain the concepts of Controllability and Observability. [5M]
- b) A unity feedback system has an open loop transfer function  $G(s) = \frac{K}{s(s+3)(s+10)}$ . [10M]  
 design a suitable lag compensator. Assume necessary data.
- Or
- 10 a) Given  $G(s) = \frac{2}{s^2+5s+6}$ . Obtain the state space model of the system in the diagonal [8M]  
 canonical form.
- b) State and prove the properties of STM (state transition matrix) [7M]

