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328556(28)

B. E. (Fifth Semester) Examination, Nov.-Dec. 2021

(New Scheme)

(Et & T Branch)

AUTOMATIC CONTROL SYSTEM

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Part (a) of each question is compulsory. Attempt any* ***two*** *parts from (b), (c) and (d) from each question.*

Unit-I

1. (a) Explain Mason's gain formula for signal flow graph. 2

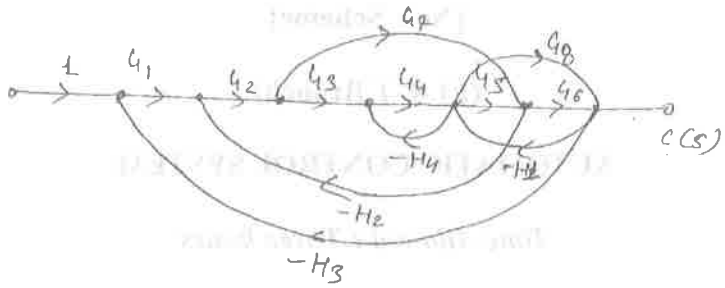
(b) For the system find the transfer function Y_4/Y_1 using SFG. 7

$$Y_2 = G_1\, Y_1 + G_3\, Y_3$$

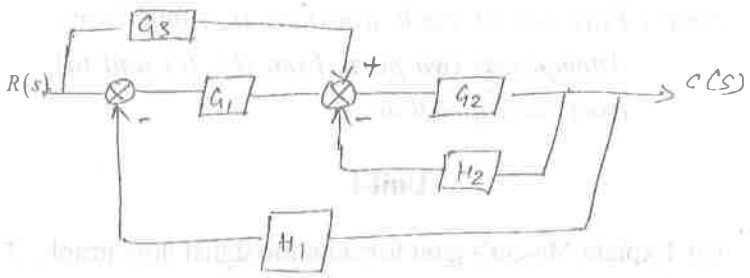
$$Y_3 = G_4\, Y_1 + G_2\, Y_2 + G_5\, Y_3$$

$$Y_4 = G_6\, Y_2 + G_7\, Y_3$$

(c) Find $C(s)/R(s)$ for the following signal flow graph. 7



(d) Obtain $C(s)/R(s)$ of the system shown in fig. using block diagram reduction rule : 7



Unit-II

2. (a) Give the name of standard signal. 2

(b) What is the difference between feedback system and non feedback system? 7

(c) When a second order control system is subjected to a unit step input, the values of $\xi = 0{\cdot}5$ and $W_n = 6$ rad/sec. Determine the rise time, peak time, setting time and peak overshoot. 7

(d) For unity feedback system the forward path transfer function is given by

$$G(s) = \frac{20}{s(s+2)(s^2+2s+20)}$$

Determine the steady state error of the system. When the *i/p* are (i) 5 (ii) 5 t (iii) $\frac{3t^2}{2}$. 7

Unit-III

3. (a) What is Routh's criterion for relative stability? 2

(b) The forward path transfer function of a unity feedback system is given by

$$G(s)=\frac{K}{s(s+4)(s+5)}$$

sketch the root locus as k varify from 0 to ∞. 7

(c) What are the steps to construct root locus and also explain different type stability? 7

(d) Use Routh criterion, investigate stability of a unity feedback system whose open loop transfer function is $G(s)=\frac{e^{-st}}{s(s+1)}$. 7

Unit-IV

4. (a) What is principle of Argument? 2

(b) A unity feedback control system has

$$G(s)=\frac{80}{s(s+2)(s+20)}$$

Draw the Bode plot and determine W_{gc} and W_{pc} and comment on the stability. 7

(c) For certain system

$$G(s)\cdot H(s)=\frac{K}{s(s+2)(s+10)}$$

Sketch the Nyquist plot and calculate range of values of k for stability. 7

(d) Sketch polat plot for a system with transfer function

$$G(s)\cdot H(s)=\frac{10}{s(s+1)(s+2)}$$

Calculate its GM in dB and comment on stability. 7

Unit-V

5. (a) Define state and state variables. 2

(b) Derive the state model in Jordon's canonical form for system having T.F. 7

$$T(s)=\frac{1}{s^3+4s^2+5s+2}$$

(c) What are the advantage state space approach and also mention disadvantage? 7

(d) Very whether the system is controlable or not. 7

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -2 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u$$