Sr. No...008606.....

MAY- 2023

B.Tech.VI SEMESTER

CONTROL SYSTEM (EC-601)

Time: 3 Hours **Max. Marks:75**

Instructions:
1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. Graph Paper, semilog paper may be provided.

PART -A

Q1 (a) What do you mean by the term 'order' of a control system? (1.5)

(b) What are compensators? (1.5)

(c) What are the advantages of the Nyquist plot? (1.5)

(d) Give the definition of Gain-margin and Phase- margin. (1.5)

(e) Define transfer function of a control system. (1.5)

(f) What are the Non-linear control system (NLCS)? (1.5)

(g) What are the properties of STM (state transient matrix)? (1.5)

(h) What does the term 'stability of a control system' imply? (1.5)

(i) What are the two conditions to be satisfied by the state variables? (1.5)

(j) What is the effect of addition of a pole to the forward path transfer function?

PART -B

Q2 (a) Obtain overall transfer function C(S)/R(S) by block-diagram reduction technique of given Fig1. (10)

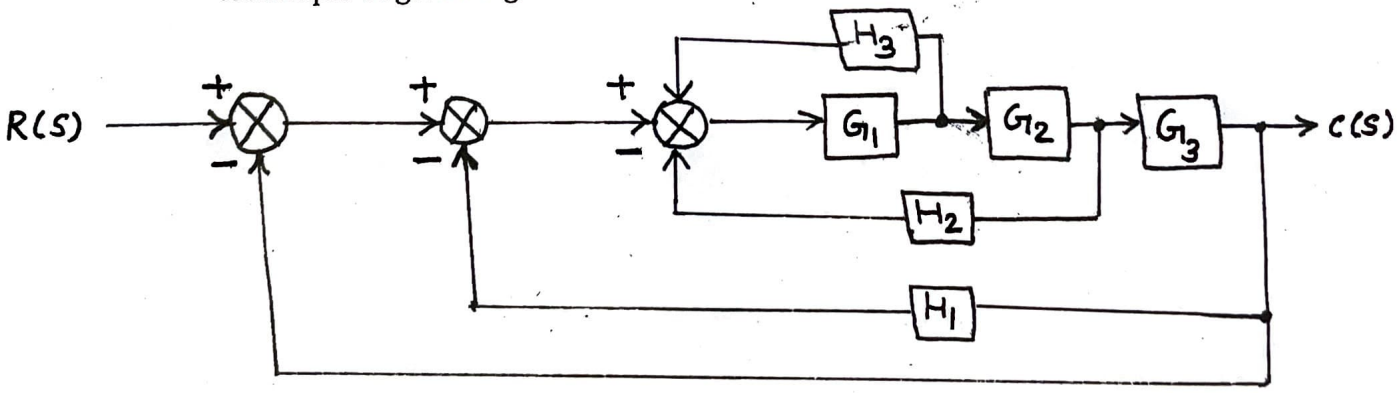

Fig.1.

(b) Explain the construction and working of a LVDT. (5)

Q3 (a) By means of the Routh criterion, determine the stability of the system represented by the following characteristic equation. (5)

$$S^5+S^4+24S^3+48S^2-25S-5=0$$

(b) Find the transfer function of the system whose signal flow graph is shown in Fig2. Using Mason's gain formula. (10)

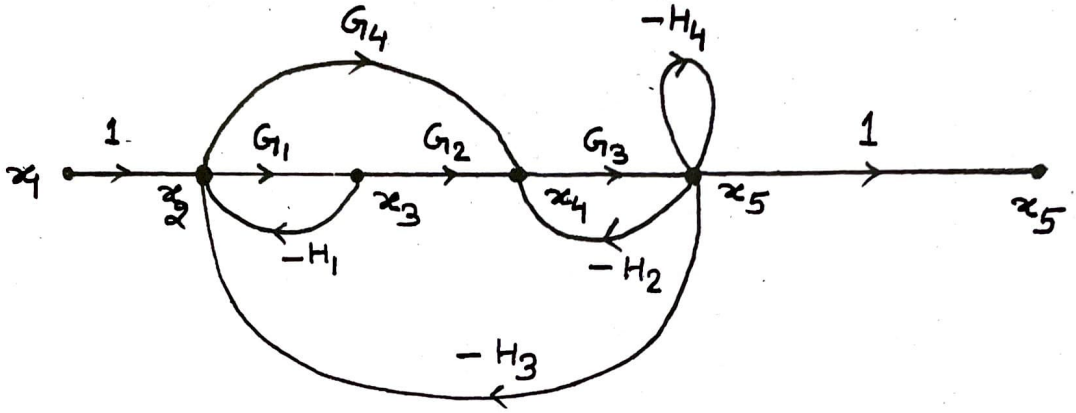

Fig.2

Q4 Define the following terms.
1.Delay time. 2. Rise time. 3.Peak time. 4.Peak overshoot. 5.Settling time. (15)

The open-loop transfer-function of a servo system with unity feedback is $G(S) = 10/S(0.1S+1)$. Evaluate the static error coefficients (K_P , K_V , K_a) for the system.

Obtain steady-state error of the system when subjected to an input given by the polynomial . $r(t) = a_o+a_1t+0.5a_2t^2$. Also evaluate the dynamic error using the dynamic error coefficients.

Q5.(a) Write the procedure for drawing the Bode Plots. (5)

(b) Sketch the Polar Plot of the function.

$$G(S) = \frac{K}{S(1+ST_1)(1+ST_2)}.$$

(10)

Q6(a) Give the introduction of optimal control. And define the optimization problems (state optimization, dynamic optimization). (10)

(b) The open loop transfer function of a control system is given by

$$G(S)H(S) = \frac{K}{S(S+1)(S+3)}$$ Sketch the root-locus. (5)

Q7 Define the following terms with respect to state variable approach. (15)

1.State. 2. State Variable. 3.State Space. 4.State Vector. 5.System matrix.

Obtain the state model of the network shown in Fig3. Assuming $R_1=R_2=1\Omega$ $C_1=C_2=1F$ and $L=1H$.

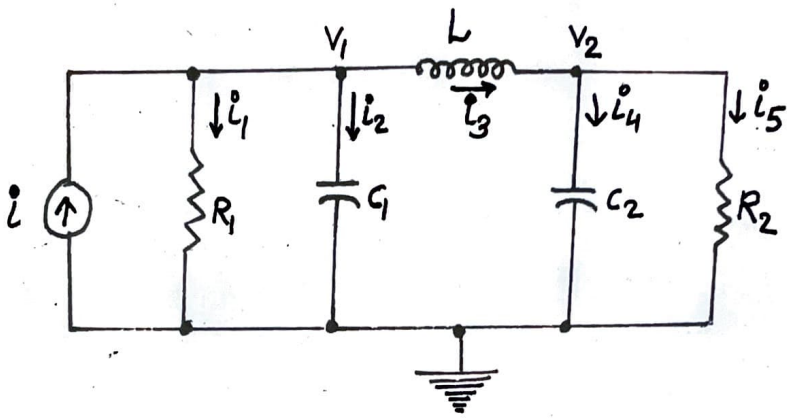

Fig.3.

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