Code No: R1922042 **R19** SET - 1

II B. Tech II Semester Supplementary Examinations, February - 2022
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) Define the closed loop control systems. Give its properties. What are the advantages and disadvantages of the closed loop systems? [8M]

b) Consider a unity feedback system with a closed loop transfer function $\frac{C(S)}{R(S)} = \frac{kS+b}{S^2+aS+b}$ [7M]

Determine the open loop transfer function G(S) and also find the e_{ss} with ramp input.

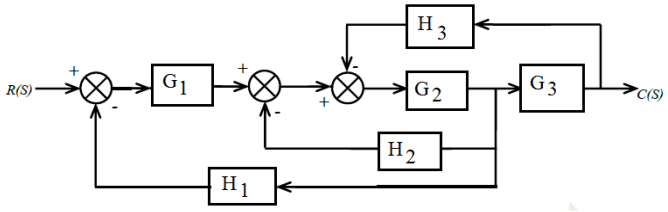
Or

2 a) Classify the feedback methods and elaborately discuss about their characteristics, advantages and disadvantages. [8M]

b) Describe the method of differential equation modeling of mechanical systems. [7M]

3 a) Derive the time domain specifications of second order system with unit step input. [7M]

b) By using block diagram reduction techniques, obtain the transfer function $\frac{C(s)}{R(s)}$ for the system shown below. [8M]



Or

4 a) Explain the field controlled DC servo motor and obtain its transfer function. [8M]

b) Define the steady state error and error constants of different types of inputs. [7M]

5 a) Explain the Routh's criteria with an example. What are its limitations? [5M]

b) Sketch the Root Locus for a unity feedback system characterized by the open loop Transfer function $G(s) = \frac{K(S+5)}{(S+1)^2}$. [10M]

Or

6 a) Sketch the Root Locus for a unity feedback system characterized by the open loop T.F. $G(S) = \frac{K(S+1.5)}{S(S+1)(S+5)}$. [8M]

b) Sketch the Bode plot for a unity feedback system characterized by the open loop T.F. $G(s) = \frac{5(s+2)}{s^2(1+0.125s)(1+0.1s)}$. And also comment on stability. [7M]
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7 a) Derive and draw the response of under damped second order system for unit step input. [8M]

b) Consider a unity feedback system having an open loop transfer function. [7M]
$G(s) = \frac{K}{s(1+0.5s)(1+4s)}$. Sketch the Polar plot and also determine the value of K so that P.M. is 450.

Or

8 a) Construct Nyquist plot for a system whose open loop transfer function is given by $G(S) = \frac{K(1+S)^2}{S^3}$. Find the range of K for stability. [8M]

b) Sketch Bode plot and Determine Gain margin, Phase Margin, Gain cross over frequency and Phase cross over frequency $G(S) = \frac{10}{S(1+0.4S)(1+0.1S)}$ [7M]

9 a) For the given open loop transfer function G(s) = $\frac{K}{S(S+4)(S+6)}$. Design suitable lead compensation so that phase margin is≥30^o and velocity error constant, K_v≥15. [8M]

b) What are the characteristics of Lead compensation? When is lead compensation implemented? [7M]

Or

10 a) Thestateequationofasystemisgivenby [10M]

$$\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\end{bmatrix}=\begin{bmatrix}-3 & 1\\ -2 & -1\end{bmatrix}\begin{bmatrix}X_1\\ X_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}U(t),\ t>0$$

i) Isthesystemcontrollable?

ii) Computethestatetransitionmatrix

iii)Computex$_1$(t)underzeroinitialconditionandaunitstepinput

b) DistinguishbetweenTransferfunctionmodel andStateSpacemodel. [5M]

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