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R13

Code No: 115DU

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, March - 2017
CONTROL SYSTEMS ENGINEERING
(Common to ECE, ETM)

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

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

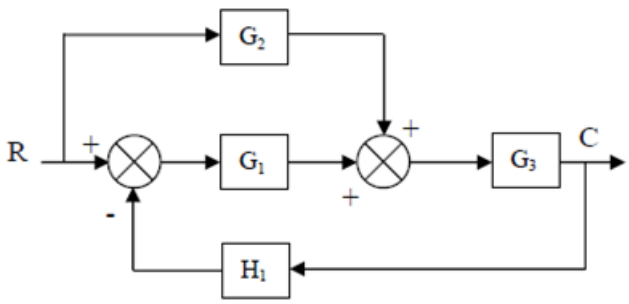
(25 Marks)

1.a)	Define transfer function. What are its limitations?	[2]
b)	Give classification of control systems.	[3]
c)	What is the difference between type and order of the system?	[2]
d)	What are the standard test signals	[3]
e)	What is the effect of adding poles to G(s) H(s) on the root loci?	[2]
f)	Write limitations of Routh's stability.	[3]
g)	Draw the pole zero location of lag compensator.	[2]
h)	Define phase margin and gain margin.	[3]
i)	Define Observability.	[2]
j)	Write Properties of State Transition Matrix.	[3]

PART - B

(50 Marks)

2.a) Illustrate at least two applications of feedback control systems.
b) Determine the transfer function C(S)/R(S) for the following block diagram. [5+5]



OR

3.a) What is feedback? Explain the effects of feedback.
b) What are differences between block diagram reduction and signal flow graph reduction? [5+5]

4.a) Derive the time response of second order under damped system due to unit step input.
b) Why derivative controller is not used in control systems? What is the effect of PI controller on the system performance? [5+5]

OR

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5. Find the Error coefficients for step, ramp and parabolic inputs for unity feed-back system having the forward transfer function. [10]

$$G(s)=\frac{14(s+3)}{s(s+5)(s^2+2s+2)}$$

6. Sketch the root locus plot of a unity feedback system whose open loop T.F is [10]

$$G(s)=\frac{K(s^2-2s+2)}{(s+2)(s+3)(s+4)}.$$

OR

7. The characteristic equations of two systems are given below

   a) $S^4 + 21S^3 + 21S^2 + 36S + 20 = 0$

   b) $S^5 + 6S^4 + 3S^3 + 2S^2 + S + 1 = 0$

   Find whether the systems are stable or not using RH Criterion. [10]

8. The open loop transfer function of certain unity feedback control system is given by $G(S)=\frac{k}{s(s+4)(s+80)}$. It is desired to have the phase margin to be at least 33^0 and velocity error constant $K_V = 30\ Sec^{-1}$. Design a phase lag series compensator. [10]

OR

9. Sketch the Bode plot for the system $G(s)=\frac{25}{s(1+s)(1+0.1s)}$ Hence find gain cross over frequency and phase cross over frequency. [10]

10. Given $X(t)=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}\begin{bmatrix}x1(t)\\ x2(t)\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}u(t)$. Find the unit step response when, $X(0)=\begin{bmatrix}1\\ 1\end{bmatrix}$ [10]

OR

11.a) Discuss the significance of State Space Analysis.

b) Consider the matrix. Compute e^{At}. [5+5]

$$A=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}$$

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