R15

Code No: 125DU

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, January/February - 2023

CONTROL SYSTEMS ENGINEERING

(Electronics and Communication Engineering)

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

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

Normal graph sheets are required:

PART - A

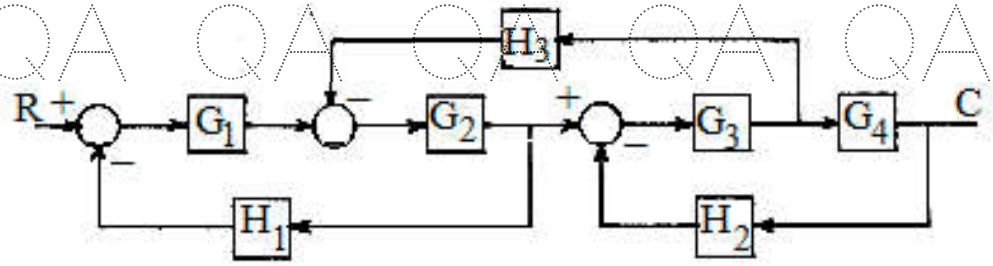
(25 Marks)

1.a)	Why is negative feedback invariably preferred in a closed loop system?	[2]
b)	Write the importance of Signal flow graph in control systems.	[3]
c)	What is the time response of the first order system?	[2]
d)	What are the test signals?	[3]
e)	Discuss asymptotes.	[2]
f)	What are the limitations of Routh Hurwitz criteria?	[3]
g)	What is lag compensator?	[2]
h)	Define phase margin.	[3]
i)	Define controllability.	[2]
j)	Explain: i) State ii) Sate variables iii) State space representation.	[3]

PART - B

(50 Marks)

2. Find the transfer function of the system represented by the following figure. [10]



OR

3.a) Write the difference between open lop and closed loop systems.
b) What is feedback? Explain the effects of feedback. [6+4]

4.a) Find out the output of the critically damped second order system when the input applied to the system is unit step input.

b) Define time domain specifications. [5+5]

OR

5.a) Explain error constants Kp, Kv and Ka for type II system.

b) Explain the effect of PD control on the performance of control system. [5+5]

6.a) A unity feedback control system has an open loop transfer function $G(S)=K/s(s^2+4s+13)$. Find i) Angle of asymptotes, centroid ii) Angle of departure.

b) How many roots of the following polynomial are in the right half, left half of s-plane and on the jω axis. $P(s)=s^5+2s^4+2s^3+4s^2+s+2=0$ [5+5]

OR

7. Draw the root locus for the unity feedback system whose open loop transfer function is $G(s)=\frac{k(s+1)}{(s-1)(s+2)(s+4)}$ find the range of k for which the system is stable. [10]

8.a) Draw and explain polar plots for type-0, type-1 and type-2 systems.

b) Enlist the step-by-step procedure for the construction of Nyquist plots. [5+5]

OR

9.a) Explain the different steps to be followed for the design of lead compensator using Bode plot.

b) Write short notes on PID controllers. [5+5]

10.a) Develop the state model for a system characterized by the following differential equation

$d^3y/dt^3 + 6d^2y/dt^2 + 11dy/dt + 6y = u(t)$.

b) Discuss the significance of state Space Analysis. [5+5]

OR

11.a) Given the transfer function of the system as $\frac{y(s)}{U(s)}=\frac{s^2+3s+3}{s^3+2s^2+3s+1}$. Write the state variable model.

b) State and prove the properties of state transition matrix. [5+5]

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