Code No: 115DU **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech III Year I Semester Examinations, February/March - 2016

CONTROL SYSTEMS ENGINEERING

(Electronics and Communication Engineering)

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. [2]
b) Describe the feedback characteristics. [3]
c) Define 'Type' and 'order' of the system. [2]
d) Write the effects of proportional derivative systems. [3]
e) What is the necessity of angle of asymptotes? [2]
f) Write the necessary conditions for Routh-Hurwitz criteria. [3]
g) Draw the pole-zero plot of Lead compensator. [2]
h) State 'Nyquist criterion' for predicting system stability. [3]
i) Draw the state diagram of a state model. [2]
j) Mention the possible number of state variables and possible number of state equations for the system described by [3]

$$\frac{d^2y}{dt^2}+5\frac{dy}{dx}+y=u$$

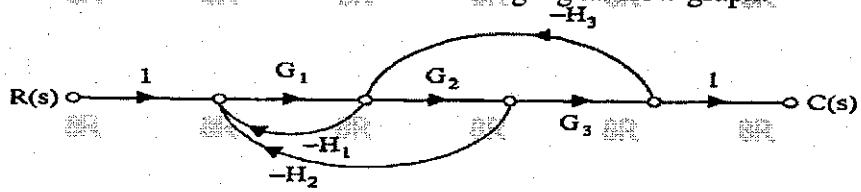
Part-B

(50 Marks)

2.a) Explain the open loop control systems with two examples.
b) Obtain the transfer function of series RLC circuit. [5+5]

OR

3.a) Write the merits and demerits of signal flow graph over block diagram reduction technique.
b) Obtain the transfer function of the following signal flow graph. [5+5]



4. What is the second order response of a system? Draw the time response of second order system excited with step input and explain all the specifications in detail.[10]

OR

5. Find the steady state error and error constants for unit step, unit ramp and unit parabolic inputs for the following system. [5+5]

a) $G(s)\dfrac{10}{s(0.1s+1)(0.5s+1)}$ b) $G(s)=\dfrac{1000}{s^2(s+1)(s+20)}$

6. Explain all the rules for constructing root locus of a given transfer function.[10]

OR

7.a) Comment on system stability for the following characteristic equation using R-H criteria.

$$N(s) = s^4+5s^3+10s^2+5s+1$$

b) Explain the system stability when entire row is zero in Routh-Hurwitz table. [5+5]

8. Find the gain margin and phase margin using bode plot for the open loop transfer function. [10]

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

OR

9.a) Explain the PID controller with a block diagram.

b) Draw the bode plot for Lag compensator. [5+5]

10.a) Write the advantages of state space approach.

b) Derive solution of a homogeneous state space equation. [5+5]

OR

11. Find controllability and observability of the system described by [10]

$$\dot{x} = Ax + Bu \quad and \quad Y = Cx$$

where

$$A = \begin{bmatrix} -2 & 1 \\ 1 & -2 \end{bmatrix}; B = \begin{bmatrix} 1 \\ 1 \end{bmatrix} \quad and \quad C = \begin{bmatrix} 0 & 1 \end{bmatrix}$$

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