JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year II Semester Examinations, July/August - 2021
CONTROL SYSTEMS
(Electrical and Electronics Engineering)

Time: 3 Hours   Max. Marks: 75

Answer any five questions
All questions carry equal marks
- - -

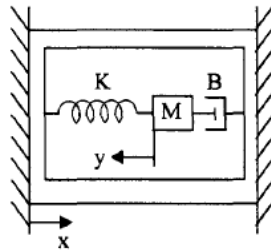1.a) Obtain the transfer function for the following mechanical translational system T(s)=Y(s)/X(s)(figure 1).

Figure: 1

b) Obtain the overall transfer functions for the following signal flow graphs shown in figure 2 using block diagram approach.   [8+7]
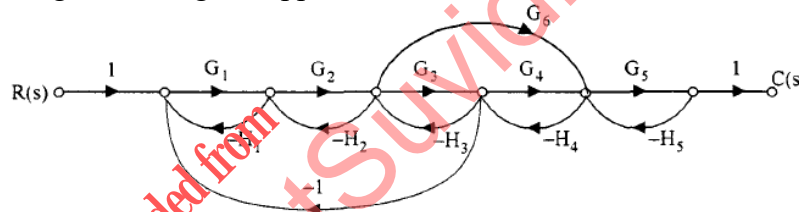

Figure: 2

2. Sketch the root locus plot of the system whose open loop T.F. is given by G(s)/H(s) =K/s(s+4)(s²+4s+13).   [15]

3.a) Define the following terms:
    i) absolute stability   ii) Marginal stability   iii) Conditional stability.
  b) By means of RH criterion determine the stability of the system represented by the characteristic equation $S^4 + 2S^3 + 8S^2 + 4S + 3 = 0$.   [8+7]

4. Draw the Bode plots for a system given by $G(s) = \dfrac{(1-0.2s)}{(1+0.2s)}$.   [15]

5. Draw the Nyquist plot for a given transfer function $\dfrac{3}{s(1+5s)(1+2s)}$. Comment on the

    system stability of open-loop and closed-loop system.   [15]

6.a) What is a Lead compensator? Realize the lag compensator with the help of basic electrical components and thus draw its frequency response.
  b) Briefly explain the design of feedback controller using root locus technique?   [8+7]

7.a) Develop the state model of liner time invariant systems. Determine the state model of the system for the following transfer function $\dfrac{Y(S)}{U(S)} = \dfrac{2S^2 + S + 5}{S^3 + 6S^2 + 11S + 4}$.

   b) Obtain the state equation and output equation for the network shown in figure 3.
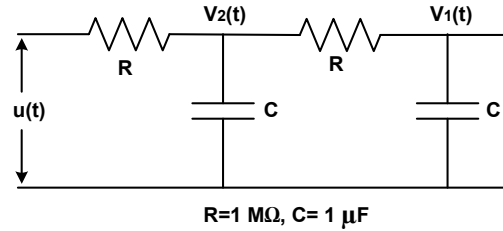

Figure: 3

Where u(t) is input and $v_1(t)$ and $v_2(t)$ are state variables and $v_1(t)$ is output variable.

[8+7]

8.a) Construct the state variable model for the system characterized by the differential equation $\dddot{y} + 6\ddot{y} + 11\dot{y} + 2y = 4u$

   b) Explain properties and significance of state transition matrix. [8+7]

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