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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year II Semester Examinations, August/September - 2022
CONTROL SYSTEMS
(Electrical and Electronics Engineering)

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

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

1.   Obtain the transfer function for the following mechanical translational system
$T(s) = \frac{Y(s)}{X(s)}$. As shown in figure 1.   [15]

Figure 1

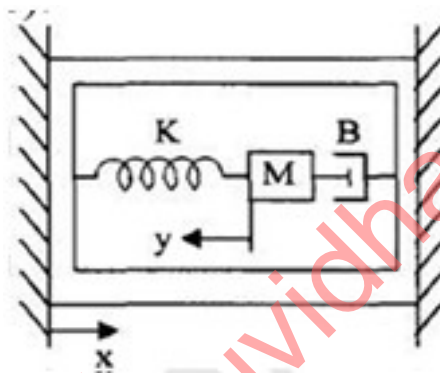2.   Using block diagram reduction technique, obtain closed loop transfer function for the
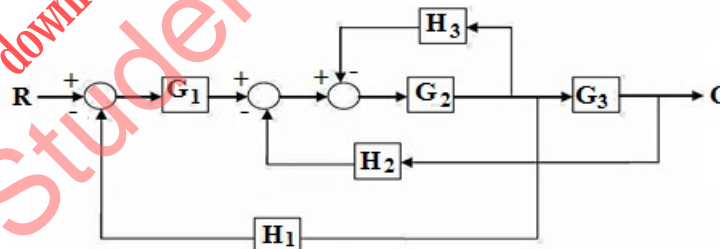figure 2 give below.   [15]

Figure 2

3.   The forward path transfer function for a unity feedback system is given
by $G(s) = \frac{K(s+2)}{s(s+3)(s^2+s+4)}$. Draw the root locus for K ≥ 0.   [15]

4.   Using Routh stability criterion, determine the stability of the unity feedback control
system with the following open loop transfer function. $\frac{C(s)}{R(s)} = \frac{9}{s(s+1)(s+6)}$.   [15]

5. Draw the polar plot for the forward path transfer function of a unity feedback control system which is given below $G(s) = \frac{1}{s(s+2)}$. [15]

6. The forward path transfer function of a unity feedback control system is $G(s) = \frac{6}{(s^2(s+3))}$. Draw the Bode plot. [15]

7.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]

8.a) Write short notes on controllability and observability.
   b) Explain properties and significance of state transition matrix. Obtain the state transition matrix of $A = \begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix}$. [8+7]

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