

- N. B.:** (1) Question No. 1 is compulsory.
 (2) Attempt any three questions from remaining five questions.
 (3) Assume suitable data if necessary.
 (4) Figures to the right indicate full marks.

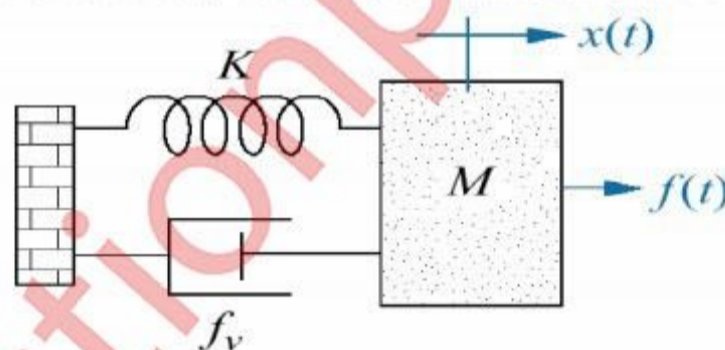
1. Attempt **any four** questions. 20

- Define absolute, relative and robust stability of the system
- What is optimal control? Explain different performance measures used for optimal control problem.
- Explain algorithm for applying Routh's stability criterion.
- Write a closed form expression for e^{At} if

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

- Explain Mason's gain formula.

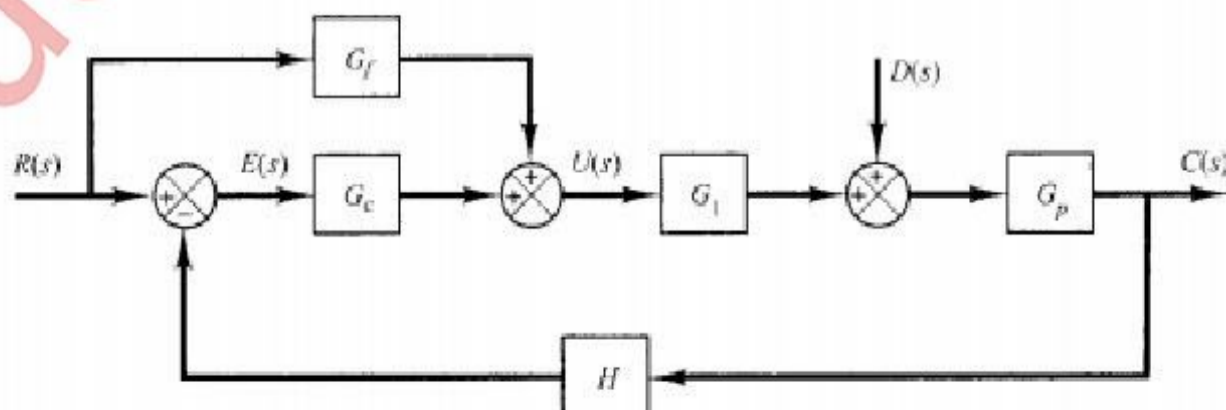
2. a) Find the transfer function $X(s) / F(s)$ for the system given below 10



b) Sketch the root locus for the given system 10

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

3. a) Obtain transfer functions $C(s)/R(s)$ and $C(s)/D(s)$ of the system shown in following figure 10

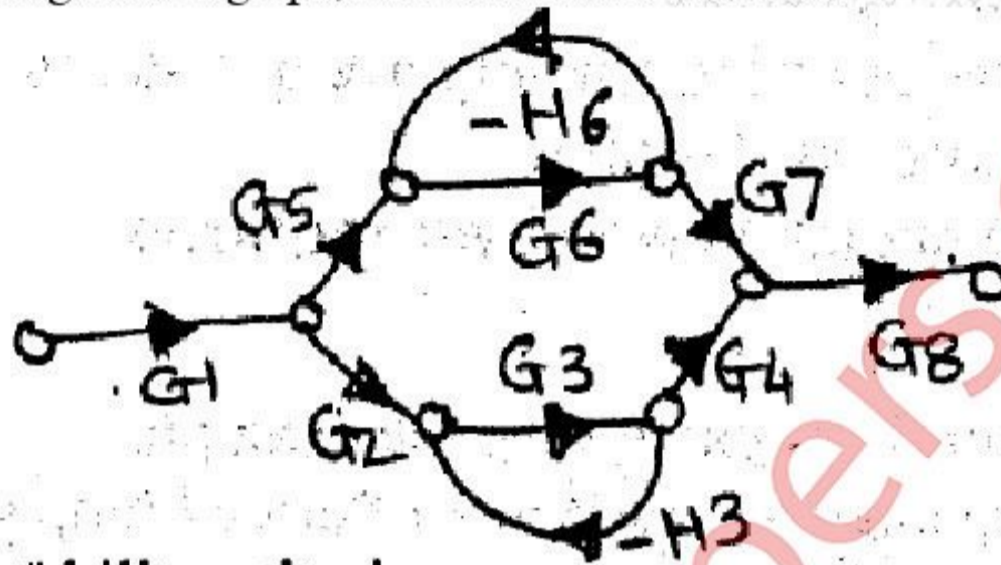


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- b) Obtain a state-space model of the following system. 10

$$G(s) = \frac{1}{(s + 1)(0.2s + 1)(s + 10)}$$

4. a) For the signal flowgraph, find the transfer function. 10



- b) Draw and explain block diagram of Adaptive control systems. 10

5. a) Draw the Bode Diagram for the transfer function. 10

$$G(s) = \frac{30(s + 10)}{s^2 + 3s + 50}$$

- b) Consider a unity-feedback system whose open-loop transfer function is 10

$$G(s) = \frac{K e^{-0.8s}}{s + 1}$$

using the Nyquist plot, determine the critical value of K for stability.

6. a) For the given the transfer function , find T_p , %MP, T_s and T_r . 10

$$G(s) = \frac{100}{s^2 + 15s + 100}$$

- b) Comment on Controllability and observability for the given state space representation. 10

$$\dot{x} = \begin{bmatrix} -2 & 1 \\ 0 & -2 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u; \quad y = \begin{bmatrix} 0 & 1 \end{bmatrix} x$$

Q. 3 (a)

Q.P code 11981

