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Name of Examination : **Summer 2021** - (Preview)

Course Code & Course Name : **EE351U - Control System**

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Maximum Marks : **60**

Duration : **3 Hrs**

[Edit](#) [Print](#) [View Answer Key](#) [Close](#) **Answer Key Submission Type:** Marking scheme with model answers and solutions of numerical

Instructions:

1. All questions are compulsory.
2. Illustrate your answer with suitable figures/sketches wherever necessary.
3. Assume suitable additional data; if required.
4. Use of logarithmic table, drawing instruments and non programmable calculators is allowed.
5. Figures to the right indicate full marks.

1) Solve any Three:

a) Find the transfer function for the following figure:

[6]

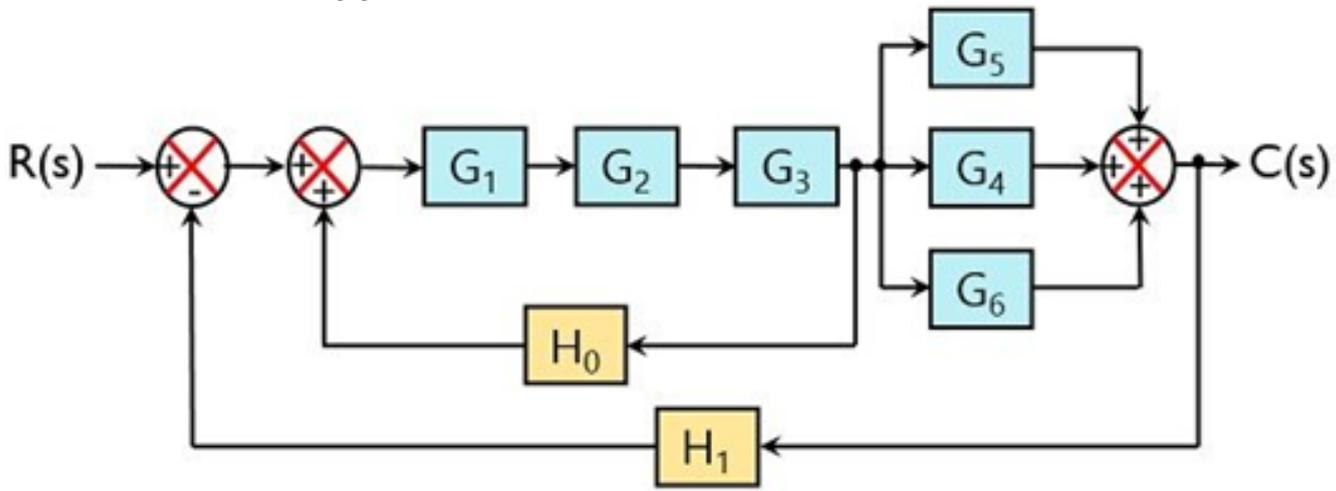


Fig.6 for Q q (a)

b) Define and explain the following with suitable example:

[6]

- i. Node
- ii. Branch

c) Write down the differential equations and with the help of Force-Voltage analogy, derive the electrical network for the following mechanical system:

[6]

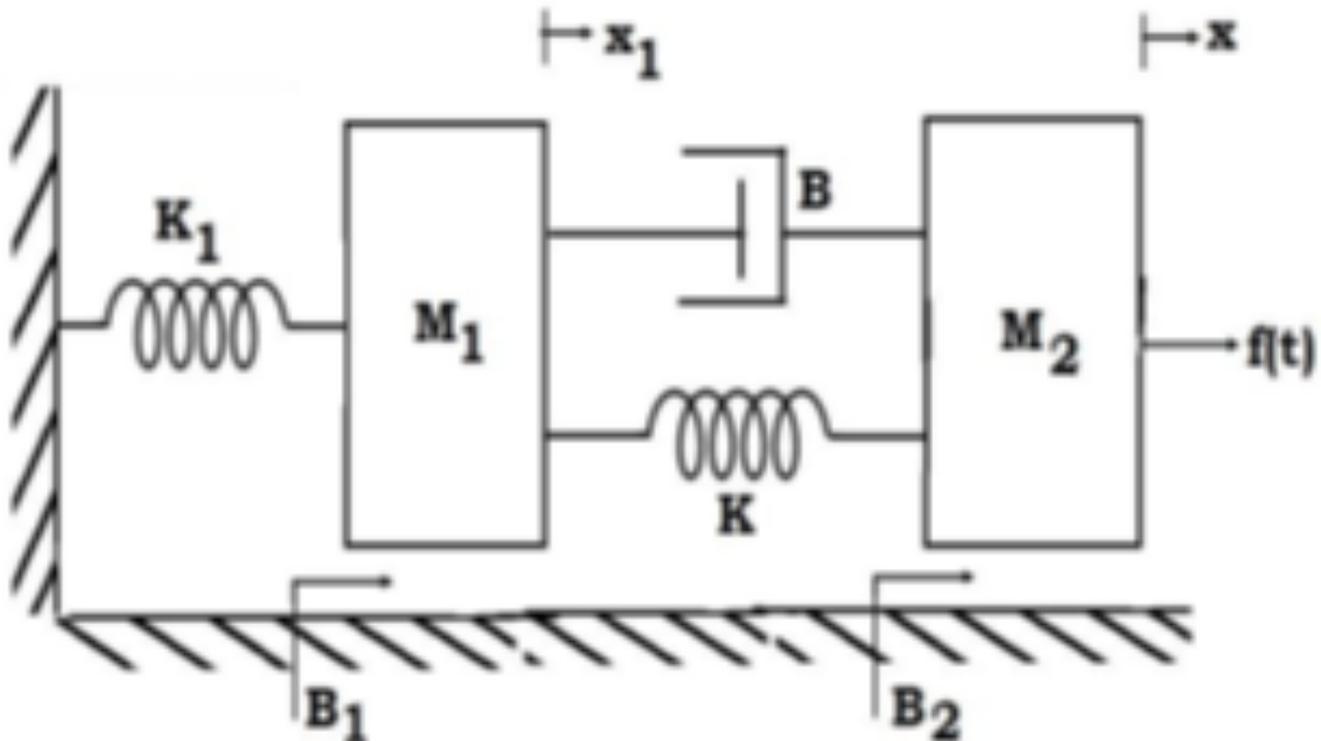


fig. for Q. 1 (c)

d) Give the advantages and dis-advantages of dc tachometer.

[6]

2) Solve any Three:

a) What changes we have to make for use of conventional single-phase Induction Motor as single-phase AC Servomotor? [6]

b) Determine the value of 'K' and 'a' such that the system has a damping ratio of 0.7 and an un-damped natural frequency of 4 rad/sec for the following system: [6]

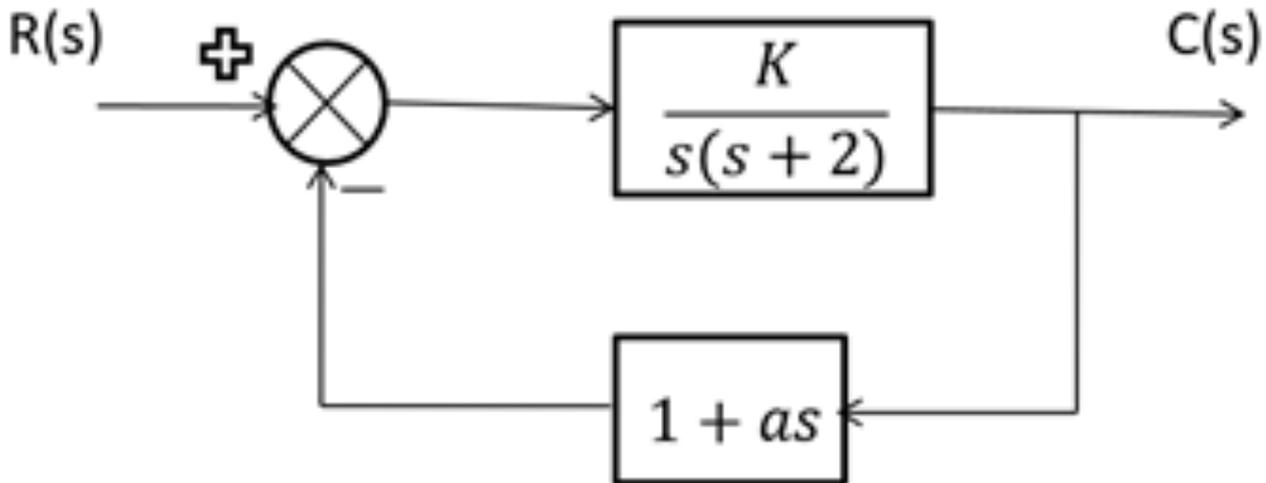


fig. for Q. 2 (b)

c) Find the unit step, ramp, and parabolic error coefficient for unity feedback system which have following transfer function: [6]

$$\frac{C(s)}{R(s)} = \frac{50}{(1+0.1s)(1+2s)}$$

. Hence, find steady state error.

d) For the unity feedback system given by [6]

$$G(s) = \frac{K}{s(s+1)(s+2)}$$

, find the range of K for stability using Routh-Hurwitz criterion.

3) Solve any Three:

a) Explain the Polar Plot in brief. [6]

b) Draw the Root Locus for the unity feedback system whose open loop transfer function is [6]

$$G(s)H(s) = \frac{k}{(s+2)(s+4)}$$

c) Draw the Bode Plot for the following open loop transfer function:

[6]

$$G(s)H(s) = \frac{10}{s(s+1)(s+5)}$$

. Determine also the Gain Margin and Phase Margin.

d) Compute the State Transition Matrix by using Laplace Transform Techniques for the system given below:

[6]

$$A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$$

4) Solve the following:

a) Develop a model for armature-controlled dc motor with armature voltage  $e(t)$  as input and load speed  $\theta(t)$  as output. Hence, obtain the transfer function of the system. [6]

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