Code No: RT31043 **R13** SET - 1

III B.Tech I Semester Supplementary Examinations, October/November-2019

CONTROL SYSTEMS

(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**
(Normal and semi & polar graph sheet are to be supplied)

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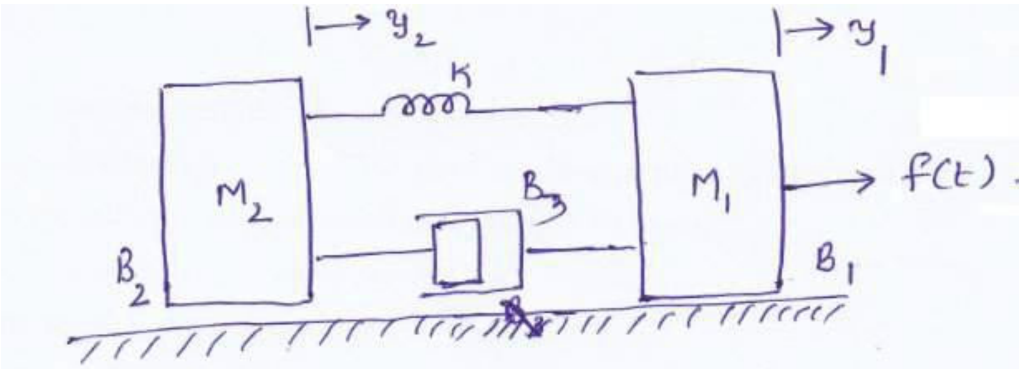
PART –A **(22 Marks)**

1 a) Explain the effect of feedback on stability [4M]
b) What are the characteristics of servomotors? [4M]
c) What are the Effects of proportional derivative systems? [4M]
d) What are effects by adding zeros in the root locus? [4M]
e) Define phase Margin. [3M]
f) What is controllability? [3M]

PART –B **(48 Marks)**

2 a) What are the advantages of Mathematical Model? [4M]
b) Write the force equations of the linear translational system shown in figure below. Draw the equivalent electrical network using force-voltage Analogy, with the help of necessary mathematical equations. [8M]



c) Derive the relationship that shows the effect of feedback on the overall gain of the system. [4M]
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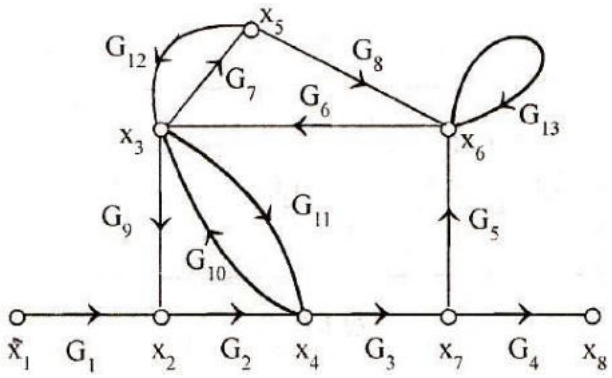
3 a) Explain the construction and operation of AC servomotor. [8M]

b) Find the transfer function for control function as shown in below figure using Mason's gain formula. [8M]



4 a) Derive the response of second order system for under damped case and when the input is unit step. [8M]

b) Derive the expression for Rise time and peak over shoot for second order for under damped system. [8M]

5 Sketch the root locus for the given system [16M]

$$GH(s) = \frac{K}{(S+1)(S+3)(s+6)}$$

Find the breakaway point on the real axis.

6 a) Sketch the Bode plot for the open loop transfer function for the unity feedback system given below and assess stability $G(s) = \frac{100}{(S+1)(2+S)}$ [8M]

b) Draw the polar plot of $G(s)H(s) = \frac{K}{S(S+3)(S+6)}$ and there from determine range of K for stability using Nyquist Criterion. [8M]

7 a) Explain the need of PID controller. [6M]

b) Construct the state model for a system characterized by the differential equation $\frac{d^3y}{dt^3} + \frac{6d^2y}{dt^2} + 11\frac{dy}{dt} + 6y = u$. Give the block diagram representation of the state model. [10M]

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