Code No: R1622042 **R16** SET - 1

II B. Tech II Semester Regular/Supplementary Examinations, November - 2020
CONTROL SYSTEMS
(Com to ECE, EIE, ECC)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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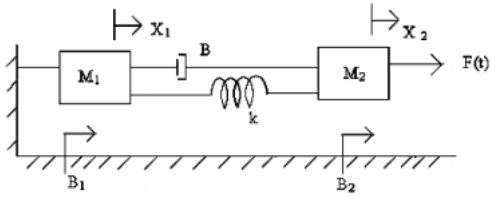
PART –A

1. a) Why negative feedback is invariably preferred in closed loop system?
   b) What is servomechanism?
   c) How the roots of characteristic equation are related to stability?
   d) State Nyquist stability criterion.
   e) .What is a compensator?
   f) Define Acquisition time.

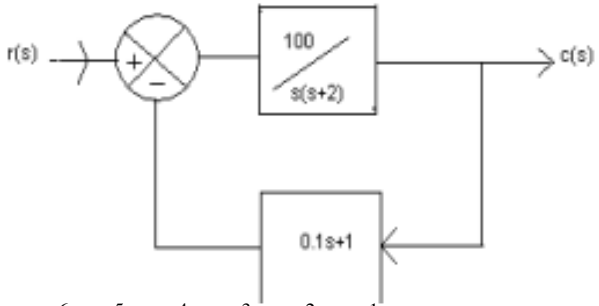
PART -B

2. a) Write the differential equations governing the Mechanical system shown in fig. and determine the transfer function.



   b) For a unity feed back system having $G(s)=\frac{K}{s(2+sT)}$ find the factor by which the time constant should be multiplied to reduce the damping ratio from 0.8 to 0.4.

3. a) Draw the response of second order system for critically damped case and when input is unit step.
   b) A potential control system with velocity feedback is shown in fig. What is the response of the system for unit step input?



4. a) $F(S)=S^6+S^5-2S^4-3S^3-7S^2-4S^1-4=0$.Find the number of roots falling in the RHS plane and LHS plane.
   b) for a system with the open loop transfer function G(S)H(S) =K(1+0.5S) (1+S)/ (1+10S) (S-1).determine the range of values of K for which the system is stable.

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5. a) Plot the Bode diagram for the following transfer function and obtain the gain and phase cross over frequencies. G(S) =KS2 / (1+0.2S) (1+0.02S). Determine the value of K for a gain cross over frequency of 20 rad/sec.
   b) ketch the Nyquist plot for a system with the open loop transfer function G(S)H(S) =K(1+0.5S) (1+S) / (1+10S) (S-1).

6. a) Explain the design procedure for lag-lead compensation.
   b) Discuss about Tuning of PID Controllers

7. a) Construct the state model and state transition matrix Ø(t) for a system characterized by the differential equation

$$\frac{d^3y}{dt^3} + 6\frac{d^2y}{dt^2} + 11\frac{dy}{dt} + 6y = u$$

   b) Explain the importance of controllability and observability of the control system model in the design of the control system.