U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

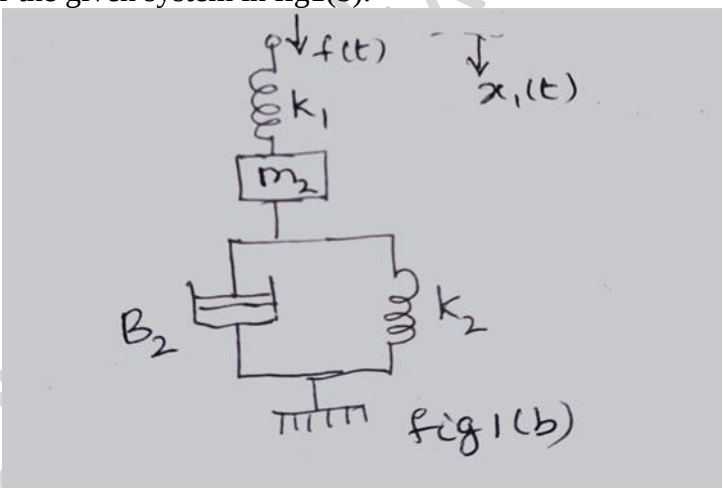
Programme: B.E. **Semester: IV**
Branch: Medical Electronics Engineering **Duration: 3 hrs.**
Course Code: 19ML4PCPCS **Max Marks: 100**
Course: Physiological Control Systems **Date: 15.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

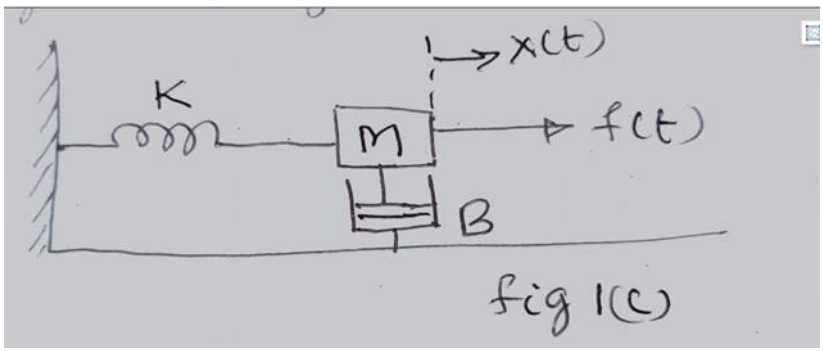
UNIT - I

1 a) Differentiate between open loop and closed control system with relevant examples. **06**

b) Draw the equivalent mechanical system and analogous system based on F-V methods for the given system in fig1(b). **10**



c) Obtain the equilibrium equation for the given system in fig1© **04**



OR

2 a) Illustrate the working of muscle stretch reflex with a neat schematic diagram. **10**

b) For the system shown in fig 2(b), draw the signal flow graph and obtain the transfer function using Mason's rule. **10**

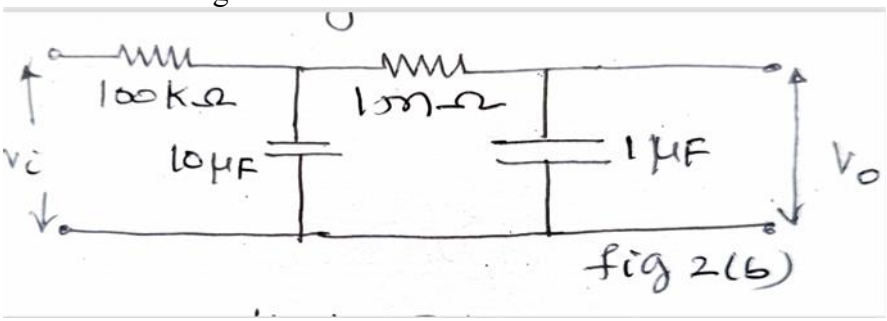


fig 2(b)

UNIT - II

3 a) Derive an expression for the underdamped response of second order feed back control system for step input. **08**

b) With a neat schematic explain the process involved in the regulation of glucose and insulin. **08**

c) Derive the expression for (i) Rise time (ii) Peak overshoot of the second order feedback system with unity gain. **04**

UNIT - III

4 a) The open loop transfer function of a unity feed back system is given by G(S) = K/S(1+ST1) (1+ST2). Derive an expression for the gain K interms of T1 and T2 for the stability of the system **06**

b) Sketch the complete root locus for the system having **14**
G(S)H(S) = K/S(S+3) (S^2+3S+4.5)

UNIT - IV

5 a) Illustrate with schematic diagram, the process of starling Heart-Lung preparation**.** **08**

b) Discuss with relevant equations minimal model of blood glucose regulation. **08**

c) Brief about closed loop identification of the respiratory control system. **04**

UNIT - V

6 a) For a particular unity feed back system **12**
G(S) = 242(S+5)/S(S+1) (S^2+5S+121) Sketch the bode plot, find
ω_{gc}, ω_{pc} G.M and PM comment on stability.

b) Define the following terms with respect to Bode plots. **08**
(i) Gain Margin (G M)
(ii) Phase Margin (P M)
(iii) Gain cross over frequency
(iv) Phase cross over frequency.

OR

7 a) Discuss the frequency response of Glucose-Insulin Regulation. **08**

b) Discuss the Bode plot of frequency response of the Linearized Lung mechanics. **08**

c) List and define the frequency domain specification. **04**

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