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

Autonomous Institute Affiliated to VTU

October 2023 Semester End Main Examinations

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

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) Reduce the block diagram using block diagram reduction technique and obtain $Y(s)/X(S)$ shown in Fig. 1(a).   **12**
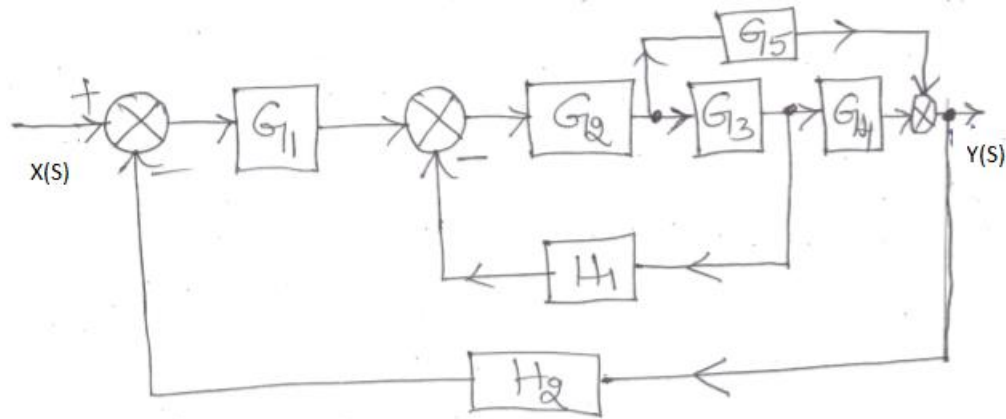

Fig.1(a)

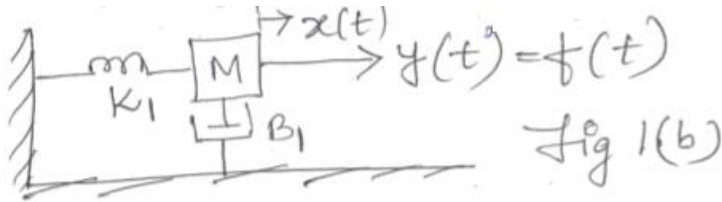b) Obtain the differential equations for the system shown in Fig. 1(b)   **08**

Fig.1(b)

OR

2 a) Obtain the set of equilibrium equations for the Fig. 2(a). Also draw the equivalent mechanical system. Write (i)F-V analogy (ii)F-I analogy for the same. **12**
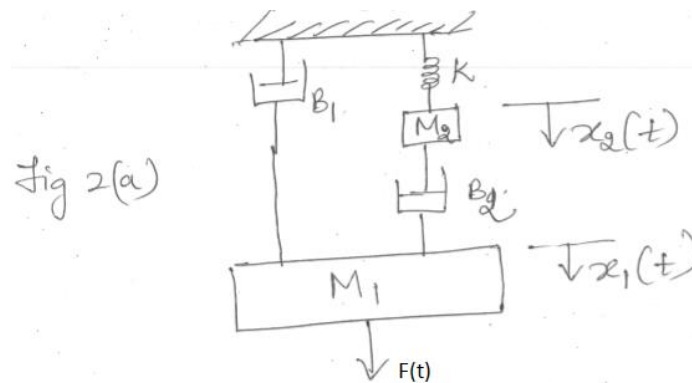

Fig.2(a)

   b) With the analysis of need for modeling derive the linear mathematical model of muscle mechanisms. **08**

UNIT - II

3 a) Derive an expression for the step response of second order feedback control system for underdamped response. **10**

   b) For unity feed back system having open loop transfer function **10**
   $G(S) = K(S+3)/S(S^3+7S^2+12S)$.
   Find (i) Type of the system ii) static error Co-efficient iii) order of the system (iv) Characteristic equation with the input of the system $(R/2)t^2$.

UNIT - III

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

   b) Elaborate on the stability analysis of the pupillary light reflex with suitable functional diagram. **08**

UNIT - IV

5 a) Demonstrate the process of Starling heart lung preparation. **10**

   b) Discuss in detail any one method of Non parametric and parametric identification methods. **10**

UNIT - V

6 a) Sketch the bode plot and find gain margin and phase margin for the following function, $G(s) =64(s+5)/s(s+2)$. **12**

   b) Describe the various frequency domain specification terminologies with respect to the bode plots. **08**

OR

7 a) Discuss the frequency response of the linearized Lung mechanics. **10**

   b) Narrate the Glucose-insulin regulation model in Type-2 diabetic patient with respect to frequency domain analysis. **10**

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