Amrita Vishwa Vidyapeetham

School of Artificial Intelligence
Course Code: 23AIDS201 Modelling, Simulation, and Analysis
Faculty Name: Dr. Yogesh Singh
Practice Sheet 01

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Batch: B.TECH. AI&DS; Sem-III Sec-F **Campus:** Bengaluru
Duration: - **Full Marks:** -

(Use this as a practice to clear and apply concepts relevant to the course and taught during lecture hours.)

1. Obtain a mathematical dynamical model of the system shown in Figure 1. Reduce the model to the state space representation and make a block diagram of the system.

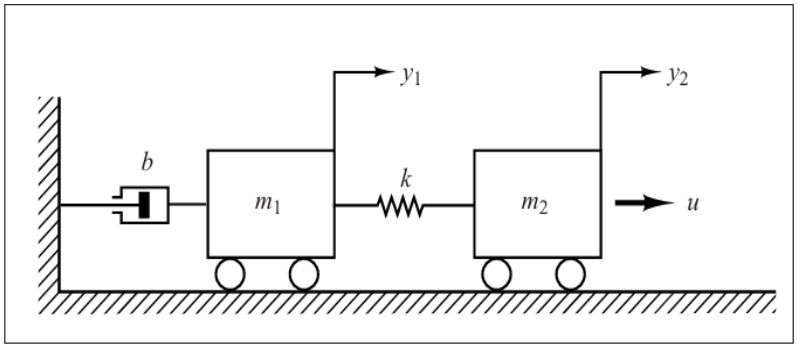

Figure 1: Mechanical System (Question 1)

2. Repeat question 1 for the Figure 2.

3. Consider the spring-loaded pendulum system shown in Figure 3. Asume that the spring force acting on the pendulum is zero when the pendulum is vertical, or $\theta = 0$. Assume also that the friction involved is negligible and the angle of oscillation θ is small. Derive a mathematical model of the system, its state space representation and construct a block diagram.

4. Repeat question 1 for the Figure 4 showing an electrical circuit.

5. Consider a suspension model that includes the mass of the wheel-tire-axle assembly (see Figure 5). The mass m_1 is one fourth the mass of the car body, and mass m_2 is the mass of the wheel-tire-axle assembly. The spring constant k_1 represents the suspension's elasticity, and k_2 represents the tire's elasticity. Obtain the mathematical model of this system, its state space representation and the block diagram.

5. Construct a bond graph model for Figure 2.
6. Construct a bond graph model for Figure 3.
7. Construct a bond graph model for Figure 4.
8. Construct a bond graph model for Figure 5.

====== Best of Luck ======

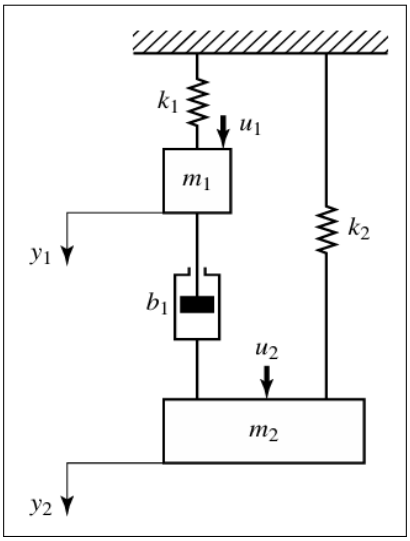

Figure 2: Mechanical System (Question 2)

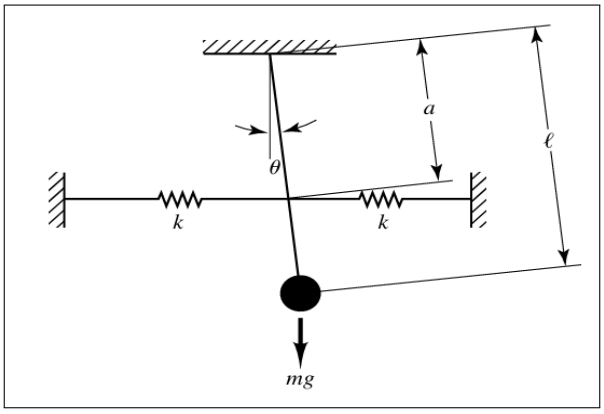

Figure 3: Spring-loaded pendulum System (Question 3)

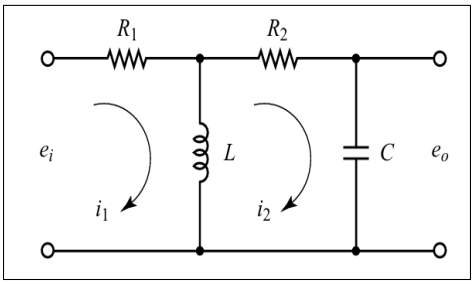

Figure 4: Electrical System (Question 4)

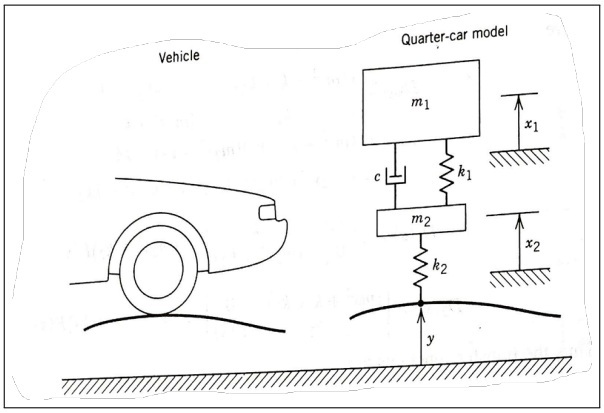

Figure 5: Two mass model of a suspension (Question 5)