University of Engineering & Technology Lahore (FSD Campus)
Department of Mechanical, Mechatronics & Manufacturing Engineering

MCT-331: Modeling and Simulation   **Due Date: 23 Dec 2022**

Reg. # _____   Total Marks: 10

Assignment: Problem Based Learning (PBL)
              CLO/PLO Mapping: CLO – 2, PLO-1
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Description:

Consider a motor-driven cart with an inverted pendulum mounted on it. You have to **model the attitude control of a space booster** while it takes off. One of the objectives is to keep the space booster in a **vertical position**. The inverted pendulum is unstable in a sense that it can fall in any direction unless a suitable **control force** is applied. Consider a **two dimensional problem** where the pendulum moves only in the plane of the page. The control force is applied to the cart.

Assume that the center of gravity of the pendulum rod is at its geometric center.

   a) Realize a given system and sketch its diagram. [2]
   b) **Apply** modeling technique to derive the equation of motion of the system. [5]
   c) Simulate the response of the system while applying a suitable test input signal. [2]
   d) Demonstrate the results. [1]

Evaluation Criteria: Total Marks: 10

Rubrics	Analytical part	Simulation Results	Discussion
Marks	7	2	1

NOTES:
   1. Avoid plagiarism and/or copying.
   2. Assume any missing data if necessary.
   3. Draw suitable diagrams wherever they are needed.
   4. Please submit the assignment in hard form.
   5. Please observe the due date (**December 23, 2022**). Marks will be deducted for a late submission.