Enchant Wings - Marvel Butterfly

Problem Statement:

In the field of biomimicry and robotic art, there is a growing interest in replicating the graceful and dynamic motion of butterfly wings for educational exhibits, entertainment, and artistic installations. However, achieving a realistic, smooth, and programmable wing-flapping mechanism that is both lightweight and energy-efficient remains a technical challenge.

This project aims to design and develop a robotic butterfly-Enchant Wings - Marvel Butterfly-that accurately simulates the natural motion of butterfly wings using servo motors and microcontroller-based control systems. The focus is on achieving:

- Smooth wing motion (0° to 90° flapping)
- Variable flap rate (20, 40, 60 flaps/min)
- Reliable, low-power operation
- Visually appealing design

Objectives:

1. Design a lightweight mechanical structure for the butterfly.
2. Integrate servo motors with hinge-based wing attachments.
3. Control motion using an Arduino and PWM signals.
4. Evaluate the performance through continuous operation tests.
5. Provide an interactive or aesthetic output (like glowing LED body or sound).

Block Diagram and Butterfly Side View:

Block Diagram