Assignment1/Quiz1: UAV

Basic Instructions

- It must be hand made.
- Timeline spans 7 days.
- Any queries post in forum.

Question 1: Aerodynamics of Aerofoil

a) **Aerofoil Shape Diagram:**

- Illustrate a typical aerofoil shape.

b) **Aerofoil Dynamics During Descent:**

1. Mark the chord line on the diagram.
2. Depict the relative airflow as if the aircraft is descending.
3. Label and indicate the angle of attack.

c) **Forces Acting on Aerofoil:**

1. Draw the lift force.
2. Depict the weight force.
3. Clearly represent these forces on the aerofoil diagram.

Question 2: Lift Equation and Aircraft Performance

a) **Lift Equation Definition:**

- Provide a concise definition of the lift equation.

b) **Altitude Maintenance and Speed Variation:**

1. Identify properties that must change to maintain altitude while altering speed.
2. Discuss the visual perception of the aircraft at slow and high speeds.

c) **High Lift Devices (Flaps) Impact:**

- Use diagrams to illustrate changes in the angle of attack with the deployment of flaps.

d) **Enhanced Lift with Fowler Flaps:**

- Explain changes in properties leading to increased lift when Fowler flaps are deployed.

Question 3: Aerodynamic Characteristics of Aerofoil

a) **Airflow Changes and Center of Pressure:**

1. Present a series of three diagrams depicting airflow changes from zero to critical angle of attack.
2. Identify the likely position of the center of pressure on each diagram.

b) **Washout and Stall Control:**

- Explain the concept of washout on a wing and its role in controlling the aircraft near the stall.

c) **Winglets for Fuel Efficiency:**

- Briefly describe how winglets enhance fuel efficiency in modern jet aircraft.

Marking Scheme:

- Question 1: Aerodynamics of Aerofoil (15 marks)
    - a) Aerofoil Shape Diagram (5 marks)
    - b) Aerofoil Dynamics During Descent (5 marks)
    - c) Forces Acting on Aerofoil (5 marks)
- Question 2: Lift Equation and Aircraft Performance (20 marks)
    - a) Lift Equation Definition (5 marks)
    - b) Altitude Maintenance and Speed Variation (5 marks)
    - c) High Lift Devices (Flaps) Impact (5 marks)
    - d) Enhanced Lift with Fowler Flaps (5 marks)
- Question 3: Aerodynamic Characteristics of Aerofoil (15 marks)
    - a) Airflow Changes and Center of Pressure (10 marks)
    - b) Washout and Stall Control (3 marks)
    - c) Winglets for Fuel Efficiency (2 marks)