AS3020*: Assignment 1

Module 1: Design of Aircrafts

Posted on 8-Aug-2024; Due at 11.59PM on 16-Aug-2024

General Instructions

1. Write this honor code and sign your name against it in the first page of your submission. Evaluation will not be done unless this is present in the submission.

   Upon my honor I state that I have received no unauthorized support and can attest that the submission reflects my understanding of the subject matter.

2. No discussions among students is permitted for this assignment. Your submission must be your own work. **The only authorized support you can avail of is your textbook and/or internet sources.**

1 Answer in not more than a sentence 3

1. **(1)** What is the design philosophy that was inspired from ship constructions and adapted to aircraft construction?

2. **(1)** Welds are ubiquitous in the construction of ship hulls. This trend does not seem to have caught on in aircrafts. Why?

3. **(1)** In a linear elastic solid, if I apply load F at point A, I get deflection δ at point B. If I apply load F at point B, then I get the same deflection δ at point A. What is the principle/theorem that underlies this behavior? *Hint*: It is due to Maxwell.

2 Answer briefly 7

1. **(3)** Tick the cases wherein the principle in Q1.3 is applicable. Provide a single sentence reason as to why/why not for each.

   - ☐ A wooden beam supporting a bridge
   - ☐ Maida dough
   - ☐ Stretching a rubber band to failure (I pull at point A and it breaks at point B. If I pull at point B will it break at point A only?)

2. **(4)** Consider the following eccentrically loaded plated. Use the coordinate system defined therein and write down the reaction force vectors that the plate experiences at the riveted points 1 and 2.

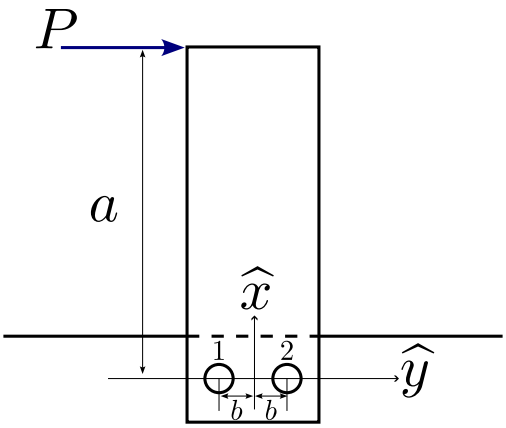

Figure 1: Schematic for Q3.2

3 Answer in detail 10

1. **(5)** Sketch the free-body-diagram of the fuselage of the following glider. Label the appropriate forces (just call them L_1,L_2,..., etc.). What are the kinds of bending moments that the fuselage experiences?

   Assume that drag in the "down" position is larger than drag in the "up" position. You can neglect the vertical tail also. State any other assumptions you make clearly.

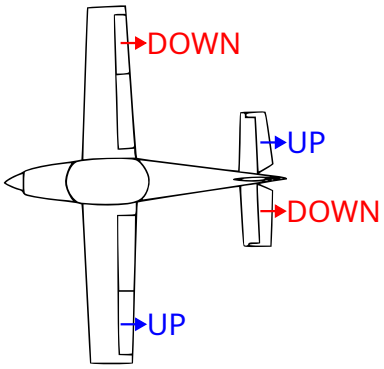

Figure 2: Aircraft figure for Q3.1

2. **(5)** Take pictures (not more than 3) of the wing section in front of the department building and label,

   - the structural components;
   - two types of fasteners.