Engineering Studies

Section II (continued)

Marks

Question 15 — Aeronautical Engineering (15 marks)

In common aircraft instruments a pitot tube is connected to both the altimeter and airspeed indicator.
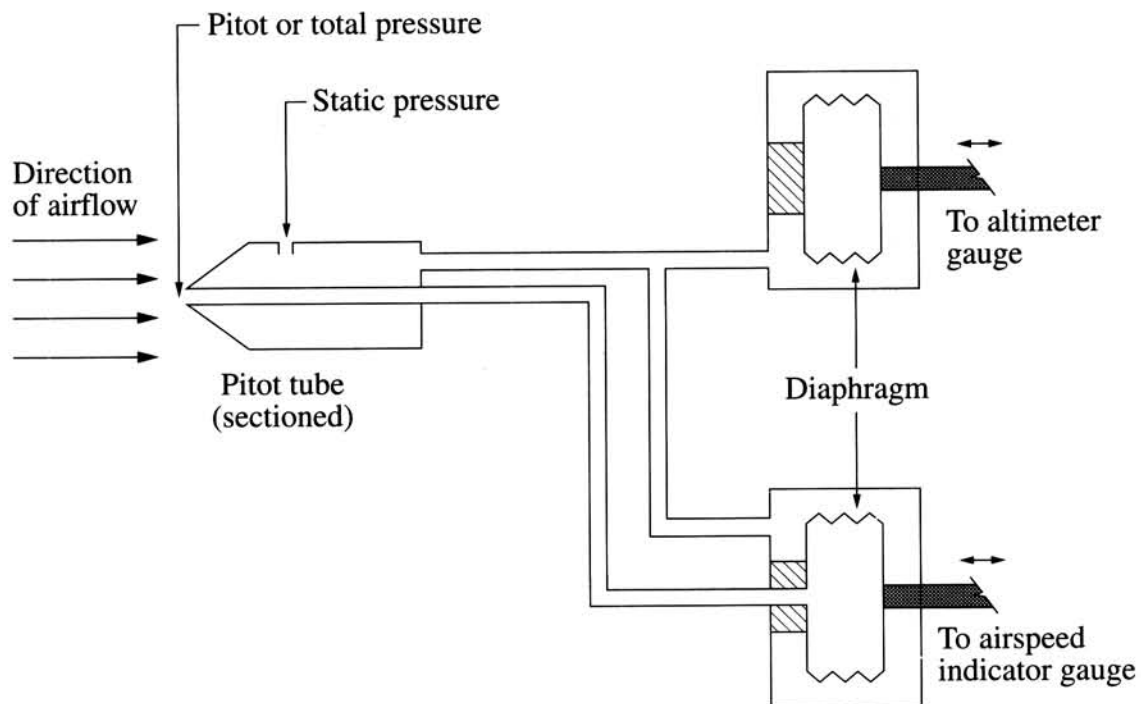
(a) Explain how the airspeed indicator determines airspeed from the pressures sensed by the pitot tube.   **3**

It senses the difference in the pressures and works out the air speed from that.

– 21 –

Question 15 (continued)

(b)   (i)   Aluminium and its alloys are generally more active than irons and   **2**
            steels in the galvanic series. Explain why aluminium alloys are more
            corrosion-resistant than steels.

....

...... They have alot less carbon

...... in them.

....

...

(ii)   Identify ONE advantage and ONE disadvantage of the use of composite   **2**
       materials to replace aluminium alloys in aircraft components.

....

...... * It may have a high resistance

...... to heat.

...... * wont be as light weight.

....

Question 15 continues on page 23

Question 15 (continued)

(c) In the diagram of an aircraft, the wing has been shown as hidden outline to reveal the wing strut, which has uniform section along its length.

400 mm

15 kN

5 m

200 mm

Wing strut

Detail of cross-section
of wing strut
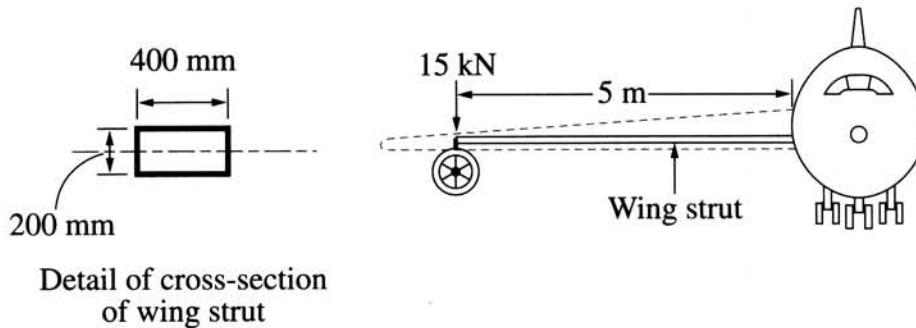
(i) Compare the nature of the stresses experienced by the surfaces of the wing strut when the aircraft is stationary on the ground and when the aircraft is in flight.

3

When the aircraft is in flight the stresses would be compressive because forces are acting on it from bottle Sids when opposed to on the ground where it is only pushing do

(ii) Determine the maximum value of the bending stress when the strut experiences a force of 15 kN at its end.

3

Use $I = 267 \times 10^6 \, mm^4$.

Bending stress = ...

Question 15 continues on page 24

Question 15 (continued)

(d)   Outline TWO conditions that may cause an aircraft to stall during flight.   **2**

··

∗ When the aircraft is flying straight
up.
∗ When it runs out of fuel.

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End of Question 15