2003 HIGHER SCHOOL CERTIFICATE EXAMINATION

Engineering Studies

Centre Number

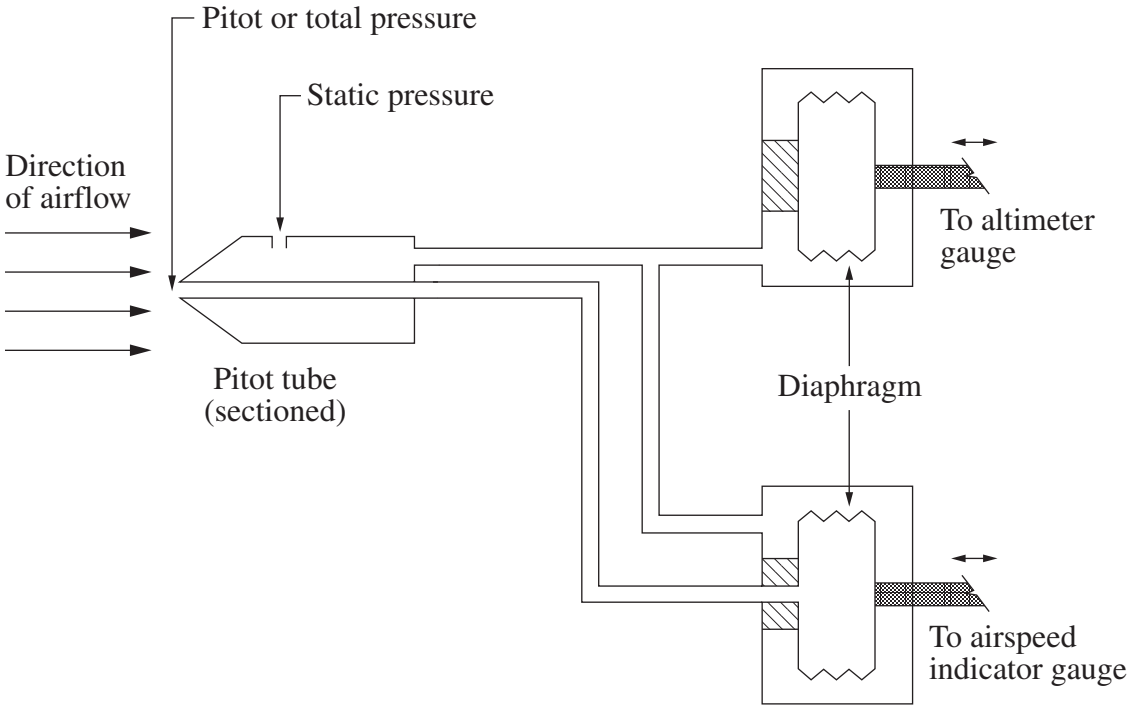
Section II (continued)

Student Number

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**

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Question 15 continues on page 22

Marks

Question 15 (continued)

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

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

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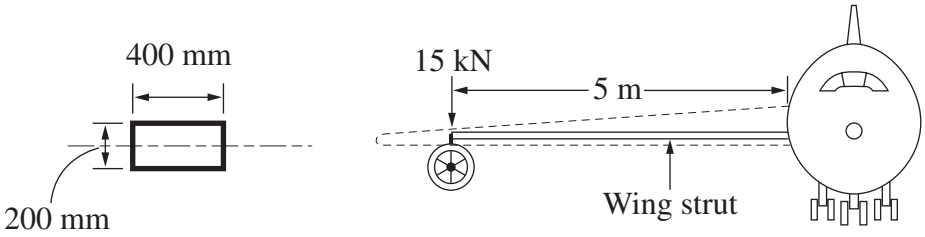
Question 15 continues on page 23

Marks

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.



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**

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(ii) Determine the maximum value of the bending stress when the strut experiences a force of 15 kN at its end. **3**

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

Bending stress = ...

Question 15 continues on page 24

Marks

Question 15 (continued)

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

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End of Question 15