2003 HIGHER SCHOOL CERTIFICATE EXAMINATION

Engineering Studies

Section II

70 marks
Attempt Questions 11–16
Allow about 2 hours for this section

Answer the questions in the spaces provided.

Marks

Question 11 — Historical and Societal Influences, and the Scope of the Profession (10 marks)

(a) The range of knowledge in which an aeronautical engineer is trained includes: **4**

- aerodynamics
- fluid mechanics
- engineering materials
- legal and ethical implications.

Demonstrate how each of these four knowledge areas may be appropriately applied to the design or construction of an aircraft or its components.

The design of the plane is influenced by aerodynamics as the correct shape must be implemented so the plane can fly ~~[illegible]~~ smoothly through the air.
The braking systems of the plane are hydraulic systems, which means understanding of fluid mechanics is necessary to provide efficient and safe landing and when on the runway.
The materials used must be non-corrosive, unstressed, strong and light so they can support the structure of the plane in high pressure, unstable environments.
Problems with pollution (noise and air), and destroying land due to infrastructure, high risks as travelling at high speeds in the air can be dangerous, and since these are powerful machines, great destruction can occur if in the wrong hands. These issues must be addressed when designing aircraft

Question 11 continues on page 10

Marks

Question 11 (continued)

(b) Improvements to materials over the past 200 years have changed the significant design features of civil structures. These features include:

- the height of the structures
- the length of unsupported spans
- the load carried by structures
- the stiffness of structures
- the expected lifespan of structures.

(i) Outline how the improvements to materials have affected any TWO of these features. **3**

The development of alloying so as to increase strength and reduce weight has allowed lifespans of these structures to increase as the materials can withstand years of use due to fatigue strength.

The load carried by structures has increased due to their increase in strength.

(ii) Discuss how society has been affected by the changes to any TWO of these features. **3**

With the increase of the height of structure, society had to develop methods of reaching the top levels ie. developing elevators. The tall heights have caused problems with telecommunications as the buildings interfere with signals. They also cause high risks of danger as shown in New York's two towers.

The increase length of unsupported spans has allowed longer bridges to be made to cross larger areas, improving transport to and from areas, and ease on commuters and decreasing travelling times.

End of Question 11