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.

*Aerodynamics - Wings need to be properly designed in order to counteract with stalling and takeoff/landing procedures
*fluid mechanics - This is done to get the most efficient fuel to weight ratios and get maximum distance.
*Engineering materials - To provide the toughest and lightest materials ie ceramics. This is to achieve higher speeds without failure.
*legal & ethical implications - knowledge in this area gives the plane the right specifications to satisfy the public. Eg noise pollution or exhaust pollution

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 lifespan of structures is a crucial aspect. The first bridges were wooden, which in a relatively short amount of time rots away. Thats bridges were later constructed of stone, concrete and steel. Another key aspect is the way bridges carry loads. A very clever way to carry maximum loads was the development of the steel truss bridge. [The triangle is the strongest geometric shape.]

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

With longer lasting bridges, people can travell accross them without fear of them collapsing. And much longer bridges can be built with these new materials (eg steel).
The truss style bridge has been very important to society. Because of its shape, much heavier loads can travel across it, with a smaller bridge

End of Question 11