

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 knowledge may be applied to the shape of the plane and position of various ailerons, flaps etc to minimise drag and improve control and efficiency. fluid mechanics is involved in the lift of a plain involving air pressures surrounding the wings. As well as calculating forces on fuselage. Engineering materials knowledge allows an engineer to assign appropriate materials according to desired properties such as strength to weight. An engineer must assess the implications of his design such as environmental effects and social effects in cities as well as knowing not to "steal" designs.

Question 11 continues on page 10

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

Improvements to materials have increased the ~~height~~ allowable height of structures as well as the length of unsupported spans eg: bridges. Improvements such as alloys and formation techniques has allowed for stronger, lighter materials that can support more weight thus increasing those features. Greater control over desired properties has also been obtained through improvements.

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

By increasing the height of buildings, a greater population is possible in the one area which in effect cause more waste material, congestion in cities and an increase in stressful living however an increase in span lengths such as bridges effectively enables road travel to previously difficult to reach places eg across a harbour or island allowing for expansion in population and shorter travel time to places, effectively decreasing stress.

End of Question 11