

2506/106

2507/106

**AIRFRAME STRUCTURES
AND AIRFIELD SAFETY**

Oct./Nov. 2017

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**DIPLOMA IN AERONAUTICAL ENGINEERING
(AIRFRAMES AND ENGINES OPTION)
DIPLOMA IN AERONAUTICAL ENGINEERING
(AVIONICS OPTION)**

MODULE I

AIRFRAME STRUCTURES AND AIRFIELD SAFETY

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Drawing instruments;

Non-programmable scientific calculator.

*This paper consists of **EIGHT** questions in **THREE** sections; **A**, **B** and **C**.*

*Answer **THREE** questions in section **A** and **ONE** question each from sections **B** and **C** in the answer booklet provided.*

Maximum marks for each part of a question are as shown.

*Candidates should answer the questions in **English**.*

This paper consists of 4 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

SECTION A: AIRFRAME STRUCTURES

Answer **THREE** questions in this section.

1. (a) Explain **five** aircraft station numbering systems. (10 marks)
- (b) With the aid of a labelled sketch, show the structural construction of aircraft tail fin. (5 marks)
- (c) Outline **five** factors that determine the size of an aircraft tail plane. (5 marks)
2. With reference to aircraft landing gear, highlight:
- (a) **three** advantages of tricycle landing gear arrangement; (3 marks)
- (b) the procedure for charging nose landing gear oleo strut; (11 marks)
- (c) **six** requirements of landing gear system. (6 marks)
3. (a) Differentiate between each of the following properties of aircraft materials:
- (i) strength and hardness;
- (ii) ductility and elasticity;
- (iii) malleability and conductivity. (6 marks)
- (b) Outline **eight** advantages of composite materials in aircraft structural construction. (8 marks)
- (c) With the aid of a labelled sketch, illustrate a typical aircraft structural insertion repair method. (6 marks)
4. (a) Outline **three** aspects considered when adjusting aircraft control cable movement. (3 marks)
- (b) With the aid of sketches, explain the function of each of the following control system components:
- (i) pulleys;
- (ii) bellcranks;
- (iii) push pull rods;
- (iv) turn buckles;
- (v) torque tube. (10 marks)
- (c) Highlight the procedure of swaging control cable terminals. (7 marks)

SECTION B: AERODYNAMICS

Answer **ONE** question in this section.

5. (a) With the aid of labelled sketches, show the difference between angle of incidence and angle of attack. (5 marks)
- (b) With the aid of a labelled sketch, differentiate between effective and geometric pitch of an aircraft propeller. (6 marks)
- (c) Table 1 represents the coefficients of lift at various angles of attack.

Table 1

Angle of attack	0°	2°	4°	6°	8°	10°	12°	14°	16°
Coefficient of lift for symmetrical aerofoil	0	0.2	0.55	0.55	0.75	0.91	1.15	1.25	1.1
Coefficient of lift for asymmetrical aerofoil	0.2	0.4	0.6	0.78	0.95	1.15	1.3	1.45	1.2

- (i) Draw the symmetrical and asymmetrical graphs. (9 marks)
- (ii) Explain the lift curves.
6. (a) With the aid of labelled sketches, differentiate between lamina and turbulent boundary layers. (6 marks)
- (b) (i) With reference to aircraft performance, explain **two** effects of each of the following:
- (I) skin friction;
 - (II) induced drag. (8 marks)
- (ii) Explain **three** methods of reducing induced drag. (6 marks)

SECTION C: AIRFIELD AND SAFETY PROCEDURES

Answer ONE question in this section.

7. (a) List **four** determinants of a safe working aircraft maintenance environment. (4 marks)
- (b) Outline **eight** safety precautions to be observed prior to fueling an aircraft. (8 marks)
- (c) Outline **eight** objectives of ICAO in international air navigation. (8 marks)
8. (a) With reference to ICAO risk management system (RMS):
- (i) explain **three** essential elements;
- (ii) draw a flow diagram of risk management process. (12 marks)
- (b) Explain **four** of each of the following stressors of aircraft maintenance personnel:
- (i) psychological;
- (ii) physiological. (8 marks)

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