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**AIRFRAME STRUCTURES,
AIRFIELD SAFETY AND PROCEDURES**

June/July 2023

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

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

MODULE I

AIRFRAME STRUCTURES, AIRFIELD SAFETY AND PROCEDURES

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Mathematical tables/Non-programmable scientific calculator;

Drawing instruments.

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

*Answer **THREE** questions from section **A**, **ONE** question from section **B** and **ONE** question from section **C**.*

All questions carry equal marks.

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

Candidates should answer the questions in English.

This paper consists of 3 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 from this section.

1. (a) Show the position and explain the operation of primary control surfaces. (10 marks)
- (b) With the aid of a sketch, describe the construction and function of each member of a semi - monocoque type of aircraft fuselage. (10 marks)
2. (a) With reference to aircraft landing gears, outline:
 - (i) the components; (4 marks)
 - (ii) **four** methods of shimmy damping; (4 marks)
 - (iii) **four** characteristics of a nose wheel. (4 marks)
- (b) With the aid of a labelled sketch, describe the construction and operation of a spring type artificial feel flight control system of an aircraft. (8 marks)
3. (a) With reference to station identification, explain each of the following:
 - (i) fuselage station;
 - (ii) water line;
 - (iii) buttock line;
 - (iv) datum. (4 marks)
- (b) With aid of labelled sketches, show each of the following helicopter system control mechanism for single rotor:
 - (i) cyclic stick pushed forward;
 - (ii) cross section of a swash plate. (10 marks)
- (c) With reference to aircraft wing construction, explain the function of each spur. (6 marks)
4. (a) Outline **four** reasons why composite materials are preferred over alloys for use in aerospace industry. (4 marks)
- (b) With reference to the flexible fuel tanks:
 - (i) describe the construction with the aid of a labelled sketch; (7 marks)
 - (ii) highlight **five** disadvantages. (5 marks)
- (c) Explain the **four** types of repairs carried out on aircraft structures. (4 marks)

SECTION B: AERODYNAMICS

Answer ONE question from this section.

5. (a) With the aid of a labelled ISA chart, show the temperature variations in the atmosphere. (10 marks)
- (b) Differentiate between vertical and horizontal stabilizer. (2 marks)
- (c) With the aid of a labelled sketch, explain the ideal arrangements of forces to maintain an aircraft flying straight and level at equilibrium. (8 marks)
6. (a) With the aid of a labelled sketch, show the geometrical features of an airfoil section. (6 marks)
- (b) With the aid of a sketch, explain the behaviour of airflow if a thin plate is held edgewise to an airstream. (6 marks)
- (c) Determine lift and drag for an aircraft flying at a speed of 600 km/ hr at sea level if wing chord is 8 metres, span of 20 metres and coefficient being 0.0056278 and 0.0562 respectively. (8 marks)

SECTION C: AIRFIELD, SAFETY AND PROCEDURES

Answer ONE question from this section.

7. (a) Explain how communication is employed in the aviation industry. (7 marks)
- (b) Differentiate risk and risk management. (5 marks)
- (c) Outline the safety precautions to be observed when handling portable electrical tools. (8 marks)
8. Highlight the precautions to be observed when:
- (a) towing an aircraft; (14 marks)
- (b) handling of compressed gases. (6 marks)

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