

2506/106
2507/106
AIRFRAME STRUCTURES AND
AIRFIELD SAFETY
June/July 2022
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

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

MODULE I

AIRFRAME STRUCTURES AND AIRFIELD SAFETY

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 and ONE question each from sections B and C in the answer booklet provided.

All questions carry equal marks.

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

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 SYSTEMS

Answer **THREE** questions from this section.

1. (a) With the aid of a labelled cross-sectional sketch, describe the construction of an aircraft rigid removable fuel tank. (14 marks)
- (b) Outline the general safety precautions when handling fuel tanks. (6 marks)
2. (a) Describe each of the following properties of materials:
 - (i) brittleness;
 - (ii) fusibility;
 - (iii) thermal expansion;
 - (iv) density;
 - (v) ductility.(10 marks)
- (b) Differentiate between wrought and cast alloys used in aircraft construction. (2 marks)
- (c) Highlight **eight** advantages of using composite materials for aircraft construction. (8 marks)
3. (a) Explain **six** methods of station location system numbering. (12 marks)
- (b) Outline **eight** major zones of an aircraft as specified by the ATA-100 specifications. (8 marks)
4. With the aid of labelled sketches, describe each of the following helicopter systems:
 - (a) semi-rigid; (10 marks)
 - (b) anti-torque system. (10 marks)

SECTION B: AERODYNAMICS

Answer ONE question from this section.

5. (a) With the aid of a sketch, describe the formation of wing tip vortices. (6 marks)
- (b) (i) With the aid of labelled sketch, describe wake turbulence. (6 marks)
- (ii) Highlight **four** ways of minimizing the chances of flying through a wake turbulence. (4 marks)
- (c) Describe skin friction drag. (4 marks)
6. (a) Explain each of the following terms as applied to aircraft weight:
- (i) mass;
- (ii) maximum take-off weight;
- (iii) maximum landing weight;
- (iv) all-up-weight. (4 marks)
- (b) (i) Outline **six** effects of overloading on aircraft performance. (7 marks)
- (ii) Show aircraft loading using a load weight versus movement index graph. (3 marks)
- (c) Highlight **five** safety precautions observed during aircraft loading. (6 marks)

SECTION C: AIRFIELD SAFETY AND PROCEDURES

Answer ONE question from this section.

7. (a) State **seven** freedoms of the air as outlined in the Chicago Convention of 1944. (7 marks)
- (b) With regards to Aircraft Maintenance Engineers Licence (AMEL) under the Kenya Civil Aviation Regulations (KCAR'S), outline the requirements for each of the following:
- (i) approval; (4 marks)
- (ii) renewal. (5 marks)
- (c) Highlight **four** limitations for an AMEL holder. (4 marks)
8. (a) Explain **eight** checks to be carried out prior to fuelling an aircraft. (8 marks)
- (b) With the aid of labelled sketches, show **four** methods of aircraft tie-down points. (8 marks)
- (c) State the functions of hydraulic ground power units with reference to aircraft ground handling. (4 marks)

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