

2506/106

2507/106

**AIRFRAME STRUCTURES AND
AIRFIELD SAFETY PROCEDURES**

Oct./Nov. 2019

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 PROCEDURES

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Drawing instruments;

Mathematical tables/Non-programmable scientific calculator.

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 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 STRUCTURES

Answer **THREE** questions from this section.

1. (a) With the aid of a labelled sketch, describe each of the following principle structural members of a wing:
- (i) ribs;
 - (ii) spars;
 - (iii) stringers.
- (14 marks)
- (b) With the aid of sketches, show the **six** typical aircraft wing plan forms. (6 marks)
2. (a) (i) Outline **four** reasons of fabric covering on an aircraft. (4 marks)
- (ii) Differentiate between each of the following aircraft fabric terms:
- (I) warp and weave;
 - (II) count and ply;
 - (III) pinked and selvage edge.
- (6 marks)
- (b) Explain each of the following properties of aircraft materials:
- (i) brittleness;
 - (ii) density;
 - (iii) fusibility;
 - (iv) conductivity;
 - (v) thermo-expansion.
- (10 marks)
3. (a) Discuss each of the following classifications of damage:
- (i) negligible;
 - (ii) repairable by patching;
 - (III) repairable by insertion.
- (6 marks)
- (b) Describe the conditions that warrant repair by replacement. (4 marks)
- (c) (i) Outline the factors to consider before performing repair by riveting. (6 marks)

- (ii) Using sketches, show each of the following:
- (I) total rivet length;
 - (II) grip length;
 - (III) amount of rivet length needed for proper snap head.
- (4 marks)

4. (a) With the aid of a labelled cross-sectional sketch, describe the construction of rigid removable fuel tank. (14 marks)
- (b) Outline the general safety precautions when working on aircraft fuel tanks. (6 marks)

SECTION B: AERODYNAMICS

Answer ONE question from this section.

5. (a) With the aid of sketches, show the effects of airflow on each of the following shapes:
- (i) flat plate at 90° ;
 - (ii) sphere;
 - (iii) sphere with a fairing;
 - (iv) sphere inside.
- (4 marks)
- (b) Discuss how each of the following is used to control the boundary layer:
- (i) slats and slots;
 - (ii) flap augmentation;
 - (iii) vortex generators;
 - (iv) stall strips;
 - (v) upper surface suction.
- (16 marks)
6. (a) With the aid of a sketch, describe the formation of tip vortices. (6 marks)
- (b) With the aid of a labelled sketch, describe wake turbulence giving **four** ways of minimizing the chances of flying through it. (10 marks)
- (c) Describe skin friction drag. (4 marks)

SECTION C: AIRFIELD, SAFETY AND PROCEDURES

Answer *ONE* question from this section.

7. (a) Define the term risk management. (1 mark)
- (b) Differentiate between 'hazard' and 'risk'. (2 marks)
- (c) Explain six types of risks. (12 marks)
- (d) With the aid of a labelled chart, show a risk assessment matrix model used to quantify risk. (5 marks)
8. (a) Differentiate between each of the following types of clouds:
- (i) cumulus and stratus;
 - (ii) cirrus and castellanus;
 - (iii) lenticularis and nimbus;
 - (iv) fracto and alto. (8 marks)
- (b) Describe each of the following classification of clouds:
- (i) low;
 - (ii) middle;
 - (iii) high. (12 marks)

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