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**AIRFRAME STRUCTURES AND
AIRFIELD SAFETY**

Oct./Nov. 2021

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 STRUCTURES

Answer **THREE** questions from this section.

1. With reference to aircraft structural damage:
 - (a) Describe each of the following classifications of damage:
 - (i) negligible damage;
 - (ii) damage repairable by patching;
 - (iii) damage repairable by insertion.

(6 marks)
 - (b) Highlight **four** reasons that will warrant the replacement of an entire part when damaged.

(4 marks)
 - (c) Outline **six** factors to consider before performing a rivet repair.

(6 marks)
 - (c) With the aid of a sketch, show each of the following:
 - (i) total rivet length;
 - (ii) grip length;
 - (iii) amount of rivet length needed for proper shop head.

(4 marks)
2. (a) With the aid of a labelled sketches:
 - (i) illustrate **six** main plane attachment position on an aircraft fuselage;

(3 marks)
 - (ii) describe the construction of a semi-monocogue fuselage;

(9 marks)
 - (b) outline **four** areas where damage is likely to occur on an aircraft wing, giving examples of each.

(8 marks)
3. (a) Outline **five** functions of the aircraft landing gear.

(5 marks)

 - (b) With the aid of a cross-sectional labelled sketch, show the construction of a nose landing gear for a light aircraft.

(5 marks)
 - (c) With the aid of sketches, describe **five** stresses acting on an aircraft structure.

(10 marks)

4. (a) Outline **four** purposes of fabric covering on an aircraft. (4 marks)
- (b) Differentiate between each of the following fabric terms:
- (i) warp and weave;
 - (ii) count and ply;
 - (iii) pinked and selvage edge. (6 marks)
- (c) Explain the physical properties of materials. (10 marks)

SECTION B: AERODYNAMICS

Answer ONE question from this section.

5. (a) (i) Differentiate between an aerostat and aerodyne. (2 marks)
- (ii) With the aid of a labelled chart, show the classification of aircrafts. (9 marks)
- (b) (i) With the aid of labelled sketch, show the control about the **three** axes of an aircraft. (6 marks)
- (ii) Outline **three** methods of thrust generation of a fixed wing aircraft. (3 marks)
6. (a) With the aid of sketches, differentiate between the effects of airflow on each of the following shapes:
- (i) flat plate sphere;
 - (ii) sphere with a fairing and sphere inside a housing. (4 marks)
- (b) Explain how each of the following is used to control the boundary layer:
- (i) slats and slots; (4 marks)
 - (ii) flap augmentation; (4 marks)
 - (iii) vortex generators; (4 marks)
 - (iv) stall strips; (2 marks)
 - (v) upper surface suction. (2 marks)

SECTION C: AIRFIELD SAFETY AND PROCEDURES

Answer ONE question from this section.

7. (a) Outline the procedure for starting an aero piston engine. (6 marks)
- (b) Highlight **fourteen** precautions to be observed when towing an aircraft. (14 marks)
8. Discuss **four** major considerations for human factor programs with reference to the PEAR model. (20 marks)

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