2506/106
2507/106
AIRFRAME STRUCTURES,
AIRFIELD SAFETY AND PROCEDURES
Oct./Nov. 2022
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;
Drawing instruments;
Mathematical tables/ Non-programmable scientific calculator.
*This paper consists of **EIGHT** questions in **THREE** sections; **A**, **B** and **C**.*
*Answer **THREE** questions in section **A**, **ONE** questions in section B and **ONE** question from section **C**.*
All questions carry equal marks.
Maximum marks for each 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.

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SECTION A: AIRFRAME STRUCTURES

*Answer **THREE** questions from this section.*

1. (a) With the aid of labelled sketches, describe the forces that act on an aircraft in flight. (10 marks)

   (b) (i) With the aid of a labelled sketch, describe the construction of a semi-monocoque fuselage. (8 marks)

   (ii) Outline **two** advantages of a semi-monocoque fuselage construction. (2 marks)

2. (a) Outline **four** factors considered when determining the repairability of a sheet metal structure. (2 marks)

   (b) Discuss the classification of damages. (18 marks)

3. (a) Explain the effect of activation of **five** types of tabs. ($7\frac{1}{2}$ marks)

   (b) With the aid of sketches, discuss each of the following control surfaces:

   (i) winglet; ($3\frac{1}{2}$ marks)
   (ii) vortex generator; (5 marks)
   (iii) stall fence. (4 marks)

4. (a) Outline the checks carried out on a helicopter after rigging of the flight controls. (8 marks)

   (b) Discuss each of the following helicopter controls:

   (i) swash plate assembly; (7 marks)
   (ii) anti-torque pedals. (5 marks)

SECTION B: AERODYNAMICS

*Answer **ONE** question from this section.*

5. (a) Explain **five** causes of wind with reference to the atmosphere. (10 marks)

   (b) With the aid of sketches, differentiate between airflow over each of the following body shapes:

   (i) flat plate and sphere;
   (ii) ovoid and streamlined. (4 marks)

(c) Describe the development of boundary layer from laminar to turbulent. (6 marks)

6. (a) With the aid of labelled graphs, explain the relationship between the:

(i) coefficient of lift and the angle of attack;
(ii) angle of attack and center of pressure position.

(12 marks)

(b) Air is moving through an aircraft engine at 40 m/s, the engine having an effective area of 300 m^2. Determine the mass flow rate through the engine. (4 marks)

(c) Describe how an aircraft reciprocating engine generates thrust. (4 marks)

SECTION C: AIRFIELD SAFETY AND PROCEDURES

Answer ONE question from this section.

7. (a) A technician falls from a crane in an aircraft hangar and suffers a fracture. As the team leader:

(i) outline **five** signs and symptoms you would look out for to confirm a fracture; (5 marks)

(ii) explain the first aid procedure you will perform on the casualty. (5 marks)

(b) (i) Define the term 'aircraft danger zone' giving **two** examples. (2 marks)

(ii) Outline **eight** precautions to be observed when taxiing a jet aircraft. (8 marks)

8. Discuss how each of the following human factors affect aviation maintenance proficiency:

(a) lack of communication; (5 marks)
(b) complacency; (5 marks)
(c) distraction; (5 marks)
(d) lack of assertiveness. (5 marks)

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