2506/106
2507/106
AIRFRAME STRUCTURES,
AIRFIELD SAFETY AND PROCEDURES
March/April 2024
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 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.

Turn over

SECTION A: AIRFRAME STRUCTURES

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

1. With the aid of a labelled sketch, describe the construction and operation of each of the following landing gear components,

   (a) Unseparated oleo pneumatic strut; (14 marks)

   (b) Shimmy damper. (6 marks)

2. (a) With the aid of labelled sketches, highlight the requirements for each of the following airframe components:

   (i) passenger aircraft doors. (10 marks)
   (ii) passenger cabin windows (6 marks)

   (b) Highlight **four** advantages of a stepped nose profile of modern commercial aircraft. (4 marks)

3. (a) With the aid of a labelled sketch, describe the constructional features of an aircraft tail fin. (9 marks)

   (b) Outline **five** requirements of sheet metal repairs. (5 marks)

   (c) Highlight **three** advantages and **three** disadvantages of a helicopter rigid rotor system. (6 marks)

4. (a) Explain the function of each of the following manuals used in aircraft maintenance:

   (i) Aircraft maintenance manual;
   (ii) Component maintenance manual;
   (iii) Structural repair manual;
   (iv) Illustrated parts catalogue;
   (v) Trouble shooting manual.

   (5 marks)

   (b) With reference to aircraft fuel tanks, outline the:

   (i) precautions to be observed during the general maintenance of aircraft fuel tanks. (10 marks)

   (ii) **five** requirements for aircraft fuel tanks (5 marks)

SECTION B: AERODYNAMICS

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

5. (a) Differentiate between aircraft centre of pressure and centre of gravity. (4 marks)

(b) A model aerofoil section (span 0.3 m, cord 50 mm) is tested in a wind tunnel at a velocity of 30.8 m/s. The maximum lift obtained is 11 N. Calculate the value of the maximum lift coefficient. (7 marks)

(c) Explain the effect of aircraft weight on each of the following:

(i) take off distance;
(ii) wing loading;
(iii) stalling.

(9 marks)

6. (a) Explain **six** characteristics of aircraft induced drag. (6 marks)

(b) Describe each of the following characteristics of an aircraft aerofoil section:

(i) lift generation;
(ii) angle of attack;
(iii) camber;
(iv) chord length;
(v) boundary layer behaviour.

(10 marks)

(c) Explain **four** requirements of an ideal aircraft aerofoil section. (4 marks)

SECTION C: AIRFIELD, SAFETY AND PROCEDURES

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

7. (a) Outline the process of jacking an aircraft based on the following headings:

   (i) Preparation; (4 marks)
   (ii) Aircraft positioning; (2 marks)
   (iii) Jacking procedure. (4 marks)

   (b) Outline the procedure followed when cleaning an aircraft. (10 marks)

8. (a) Discuss examples of potential human factors problems from the Dirty Dozen developed by Gordon Duport for Transport Canada. (18 marks)

   (b) With reference to peer pressure describe conformity. (2 marks)

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