2506/106
2507/106
AIRFRAME STRUCTURES,
AIRFIELD SAFETY AND PROCEDURES
Oct./Nov. 2018
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.

SECTION B: AERODYNAMICS

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

5. (a) Explain the factors that affect lift generation. (8 marks)

(b) With reference to generation of wing lift on a subsonic aerofoil, illustrate:

(i) pressure distribution at 4° angle of attack;

(ii) lift distribution within each of the following angles of attack $-4°, 0°, 4°, 8°, 12°, 16°$ and $20°$. (12 marks)

6. (a) Define 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 an aircraft.

(ii) Illustrate aircraft loading using a load weight versus moment index graph.

(11 marks)

(c) Highlight the safety precautions observed during aircraft loading. (5 marks)

SECTION A: AIRFRAME STRUCTURES

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

1. (a) Describe the **three** aircraft structural classifications. (6 marks)

   (b) With the aid of sketches, highlight the procedure of performing a channel patch repair. (14 marks)

2. With the aid of labelled sketches, describe the:

   (a) semi-rigid helicopter rotor system; (10 marks)

   (b) helicopter anti-torgue system. (10 marks)

3. (a) With the aid of labelled sketches:

      (i) illustrate **six** main-plane attachment positions on an aircraft;

      (ii) explain the construction of a monocogue fuselage. (12 marks)

   (b) Explain **four** checks carried out on an aircraft wing, giving examples for each. (8 marks)

4. (a) Explain each of the following properties of materials:

      (i) brittleness;

      (ii) fusibility;

      (iii) thermal expansion;

      (iv) density;

      (v) ductility.

      (10 marks)

   (b) (i) Describe the **two** types of aluminium alloys used in aircraft construction.

      (ii) Outline **six** advantages of using composites as materials for aircraft construction. (10 marks)

SECTION C: AIRFIELD SAFETY AND PROCEDURES

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

7. (a) Highlight the procedure for starting an aeropiston engine. (6 marks)

(b) Outline the precautions to be observed when towing an aircraft. (14 marks)

8. (a) State the freedoms of the air as outlined in the Chicago convention, 1944. (7 marks)

(b) With reference to aircraft maintenance engineers (AMEL), under the Kenya Civil Aviation Regulations (KCARS), outline the requirements for each of the following:

(i) approval;

(ii) renewal;

(iii) limitations of an AMEL holder.

(13 marks)

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