2506/106
2507/106
AIRFRAME STRUCTURES, AIRFIELD SAFETY AND PROCEDURES

June/July 2017
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;
non-programmable scientific calculator.
*This paper consists of **THREE** sections.*
*Answer **THREE** questions in section **A**, **ONE** question in section **B** and **ONE** question in section **C**.*
All questions carry equal marks.
Maximum marks for each part of the question are as indicated.
Candidates should answer the questions in English.

This paper consists of 5 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 labelled sketches, differentiate between truss type and semi-monocoque fuselage construction. (4 marks)

(b) Define each of the following terms as applied to aircraft location numbering system:

(i) buttock line or buttline (BL);
(ii) water line (WL);
(iii) aileron station (AS);
(iv) flap station (KS);
(v) nacelle station. (5 marks)

(c) (i) Outline **three** reasons why an aircraft manufacturer would use a nylon coated cable in aircraft control systems. (3 marks)

(ii) With the aid of labelled sketches, explain the operation of each of the following:

(I) tensiometer;
(II) turnbuckle. (8 marks)

2. (a) (i) Outline **five** functions of aircraft tabs. (5 marks)

(ii) With the aid of sketches, differentiate between winglets and wingfence. (4 marks)

(b) (i) Describe **four** requirements for rotor blade preservation and storage. (4 marks)

(ii) With the aid of a labelled sketch, explain the operation of a fully articulated helicopter rotor system. (7 marks)

3. (a) List **two** advantages of tricycle landing gear and **two** disadvantages of a tailwheel landing gear. (4 marks)

(b) With the aid of a labelled sketch, explain the construction of a nose-wheel landing gear of a light aircraft. (16 marks)

4. (a) Highlight the procedure for removing a protruding head rivet. (5 marks)

(b) Describe each of the following types of defects that occur on an aircraft structure:

(i) burnishing;
(ii) burr;
(iii) corrosion;
(iv) crack;
(v) dent;
(vi) erosion.

(6 marks)

(c) Explain each of the following types of fuel tanks:

(i) rigid removable;
(ii) bladder;
(iii) integral.

(9 marks)

SECTION B: AERODYNAMICS

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

5. (a) Explain each of the following types of drag, stating how each can be reduced:

(i) form;
(ii) interference;
(iii) skin friction.

(6 marks)

(b) With the aid of sketches, show the pressure distribution and the centre of pressure changes with each of the following angles of attack:

(i) -8°;
(ii) + 4°;
(iii) +10°.

(9 marks)

(c) Outline **five** ways of avoiding the effects of wake turbulence. (5 marks)

6. (a) Given

Chord = 2 metres
A.O.A = 6°
Speed = 100 knots
C_L = 0.06
C_D = 0.028
Cm = -0.09 about the aerodynamic center.

Determine the:

(i) lift;
(ii) drag;
(iii) pitching moment.

(8 marks)

(b) Explain **six** characteristics of an ideal aerofoil. (12 marks)

SECTION C: AIRFIELD AND SAFETY PROCEDURES

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

7. (a) (i) Highlight **five** precautions to be observed before starting an aircraft engine. (5 marks)

(ii) With the aid of a labelled sketch, show the gas turbine engine intake and exhaust hazard areas. (5 marks)

(b) (i) State the meaning of the following standard taxing light signals:

(I) flashing green;
(II) steady red;
(III) flashing red;
(IV) flashing white;
(V) alternate green and red.

($2\frac{1}{2}$ marks)

(ii) State the ICAO dimensions for registration marks on a fixed wing aircraft in each of the following areas:

(I) wing;
(II) fuselage;
(III) fin.

($1\frac{1}{2}$ marks)

① cleared to taxi
② stop
③ - - -
④ Return to start point
⑤ - - -

(c) Differentiate between each of the following giving examples:

(i) unintentional and intentional error;

(ii) active and latent error.

(4 marks)

(d) Lack of assertiveness can affect the maintenance proficiency of an aircraft technician. Outline **four** ways to offset this. (2 marks)

8. (a) (i) State **five** types of information contained in the certificate of air navigation. (5 marks)

(ii) Highlight **seven** functions of the meteorological services for air navigation in support of aviation. (7 marks)

(b) Explain **four** types of inspections carried out on each of the following:

(i) propellor;
(ii) landing gear.

(8 marks)

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