

2506/106  
2507/106  
AIRFRAME STRUCTURES,  
AIRFIELD SAFETY AND  
PROCEDURES  
June/July 2019  
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:*

*Drawing instruments;*

*Mathematical tables/Non-programmable 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 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 a labelled chart, show the classification of aircraft. (10 marks)
- (b) With the aid of sketches, describe the major structural stresses acting on the aircraft fuselage. (10 marks)
2. (a) Differentiate between each of the following with reference to landing gear:
- (i) tri-cycle and conventional;
  - (ii) fixed and retractable;
  - (iii) skids and floats. (6 marks)
- (b) Highlight **three** advantages of a tricycle landing gear. (3 marks)
- (c) Outline **six** reasons for use of magnesium alloy in landing gear construction. (3 marks)
- (d) With reference to nose landing gear assembly:
- (i) sketch and label the assembly;
  - (ii) explain the function of each of the following:
    - (I) trunnion;
    - (II) torque links;
    - (III) shimmy damper. (8 marks)
3. (a) With the aid of labelled sketches:
- (i) Explain the operation of a manually operated elevator control mechanism. (10 marks)
  - (ii) Show the construction of an elevator hydro-mechanical system. (6 marks)
- (b) Discuss the replacement of control cables during maintenance. (4 marks)



4. (a) With reference to ATA Chapter 51;
- (i) name the chapter;
  - (ii) outline the sections of the chapter.
- (10 marks)
- (b) Highlight the types of information required before maintenance. (6 marks)
- (c) Define each of the following terms as applied to aircraft maintenance:
- (i) alterations;
  - (ii) major repair;
  - (iii) minor repair;
  - (iv) heavy maintenance.
- (4 marks)

### SECTION B: AERODYNAMICS

*Answer ONE question from this section.*

5. (a) Describe the hazards associated with each of the following in flight:
- (i) crosswind;
  - (ii) turbulence;
  - (iii) thunderstorm.
- (6 marks)
- (b) Differentiate between each of the following as applied to triangle of velocities:
- (i) course and heading;
  - (ii) drift angle and wind correction angle;
  - (iii) air speed and ground speed.
- (6 marks)
- (c) An aircraft is to be flown from point A to B  $090^\circ$  (EAST). Wind at the altitude of the intended flight is 40 knots from North east ( $045^\circ$ ). The true speed of the aircraft is 120 knots. Using the triangle of velocities determine:
- (i) heading;
  - (ii) wind correction;
  - (iii) ground speed.  
(Use a scale of 1 cm = 10 knots)
- (8 marks)



6. (a) Differentiate between each of the following with regard to aerofoil nomenclature:
- (i) chordline and chord;
  - (ii) camber and mean camber;
  - (iii) aspect ratio and fineness ratio. (6 marks)
- (b) (i) With reference to aerofoil design, explain the NACA five-digit aerofoil series, using an example of NACA 23012. (5 marks)
- (ii) With reference to the four digit NACA series aerofoil shape, outline **three**
- (I) advantages;
  - (II) disadvantages;
  - (III) applications. (9 marks)

### SECTION C: AIRFIELD SAFETY AND PROCEDURES

*Answer ONE question from this section.*

7. (a) Differentiate between each of the following types of laws:
- (i) civil and criminal;
  - (ii) common and constitutional;
  - (iii) international and aviation. (6 marks)
- (b) With reference to Paris Aviation Convention of 1919:
- (i) Describe the historical background; (6 marks)
  - (ii) Outline the **four** principles that governed in drafting; (4 marks)
  - (iii) List **eight** chapters. (4 marks)



8. With reference to aircraft ground handling, highlight the precautions to be observed:

(a) prior to refuelling an aircraft; (10 marks)

(b) during refuelling. (10 marks)

**THIS IS THE LAST PRINTED PAGE.**