

2506/106  
2507/106  
AIRFRAME STRUCTURES  
AND AIRFIELD SAFETY  
June/July 2020  
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL  
DIPLOMA IN AERONAUTICAL ENGINEERING  
(AIRFRAMES AND ENGINES OPTION)  
(AVIONICS OPTION)

MODULE I

AIRFRAME STRUCTURES AND AIRFIELD SAFETY

3 hours

INSTRUCTIONS TO CANDIDATES

*You should have the following for this examination:*

*Answer booklet;*

*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 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.**



## SECTION A: AIRFRAME STRUCTURES

Answer **THREE** questions from this section.

1. (a) With the aid of labelled sketches, describe the:
- (i) structural stresses that act on an aircraft fuselage. (10 marks)
  - (ii) construction of a semi-monocoque fuselage. (8 marks)
- (b) Outline **two** advantages of a semi-monocoque fuselage construction. (2 marks)
2. (a) Highlight **four** factors considered by an aircraft technician when determining the reparability of a sheet metal structure. (4 marks)
- (b) Discuss **four** classification damages according to KCARs. (16 marks)
3. (a) Outline the name and explain the effect of activation of each tab in an aircraft flight control system. (10 marks)
- (b) With the aid of sketches, discuss each of the following wing features:
- (i) winglet; (3 marks)
  - (ii) vortex generators; (4 marks)
  - (iii) stall fence. (3 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) With reference to the atmosphere, explain **five** causes of wind. (10 marks)
- (b) With the aid of sketches, show the difference between the airflow over each of the following body shapes:
- (i) flat plate and sphere;
  - (ii) ovoid and streamline.
- (4 marks)



- (c) Describe the development of the boundary layer from laminar to turbulent. (6 marks)
6. (a) With the aid of labelled graphs, explain the relationship between:
- (i) the coefficient of lift and angle of attack;
- (ii) angle of attack and centre of pressure position. (12 marks)
- (b) Determine the mass flow rate through a venturi intake duct if the air is moving at  $40 \text{ m/s}$  and the effective area is  $300 \text{ m}^2$ . (4 marks)
- (c) Describe how an aircraft reciprocating engine generate thrust. (4 marks)

### SECTION C: AIRFIELD, SAFETY AND PROCEDURES

*Answer ONE question from this section.*

7. (a) A technician falls from a crane in the 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 during taxing a wide body 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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