

2506/106
2507/106
**AIRFRAME STRUCTURES
AND AIRFIELD SAFETY**
Oct./Nov. 2016
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL
DIPLOMA IN AERONAUTICAL ENGINEERING
(AIRFRAME 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;

Mathematical tables/Non-programmable Scientific calculator;

Drawing instruments.

This paper consists of EIGHT questions in THREE sections; A, B and C.

Answer THREE questions in 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 indicated.

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 STRUCTURE

Answer **THREE** questions from this section.

1. (a) With the aid of sketches, explain **five** types of loads which aircraft structural members are subjected to during operation. (10 marks)
- (b) With the aid of sketches, differentiate between each of the following aircraft types: (10 marks)
- (i) helicopter and gyroplane;
- (ii) flying boat and float plane.

2. (a) With the aid of sketches, explain how each of the following reference lines are used in aircraft station numbering:

- (i) butt line; Horizontal Stationing (10 marks)
- (ii) water line.

- (b) (i) Define each of the following aircraft structural terms:

(I) ATA - 100;

(II) Zoning.

- (ii) Classify structural zoning and give **two** examples for each.

- (iii) Outline **two** advantages of zoning. (10 marks)

3. (a) With the aid of a labelled sketch, describe the helicopter flight controls. (16 marks)

- (b) Explain the function of each of the following helicopter components:

(i) clutch;

(ii) free wheeling unit. (4 marks)

4. Highlight the procedure of carrying out each of the following:

(a) preparation of a damaged area for repair; (5 marks)

(b) patch repair to a pressurized area; (5 marks)

(c) making a simple bend on a sheet metal. (10 marks)

pitch change

wing platform
aspect ratio
weight/lift ratio

SECTION B: AERODYNAMICS

Answer ONE question from this section.

- 5. (a) Outline **six** ways in which lift can be increased for landing and take-off. (6 marks)
- (b) Outline **four** parameters that affect the thickness of the boundary layer. (4 marks)
- (c) Explain **five** characteristics of an ideal aerofoil section. (10 marks)
- 6. (a) A monoplane wing of area 36 m² has a span of 15 m and chord of 2.4 m. Calculate the:
 - (i) induced drag coefficient;
 - (ii) induced drag. (4 marks)
- (b) Table 1 represents data of coefficient of lift and angle of attack.

Table 1

Angle of attack	-2	0	2	4	6	8	10	12	14	16	18	20
Coefficient of lift	0	0.19	0.3	0.44	0.6	0.72	0.88	1.0	1.19	1.16	0.96	0.6

Using the data:

- (i) draw the lift curve;
- (ii) explain the relationship between lift and angle of attack. (16 marks)

SECTION C: AIRFIELD SAFETY AND PROCEDURES

Answer ONE question from this section.

Tension
Compression
Shear
Torsion
bending

- 7. (a) Outline **four** impacts of noise on performance of personnel in a maintenance organization. (4 marks)
- (b) Explain how social psychology affects the human limitations in the aircraft maintenance organization and aviation industry. (16 marks)
- 8. (a) State the categories of licence without type rating that Kenya Civil Aviation Authority can issue to aircraft maintenance engineers. (6 marks)
- (b) State **five** functions of a ground power unit. (5 marks)
- (c) Outline the operating procedures of each of the following:
 - (i) air starter unit;
 - (ii) aircraft ground power unit. (9 marks)

$$L = \frac{1}{2} \rho v^2 C_L \cdot S \cdot C$$

$$D = \frac{1}{2} \rho v^2 C_D \cdot S \cdot C$$

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2507/106
-hardness
-money & leave
-man's work
-smallest
-trick of jobs

3 - maintenance is dirty work
-sense of pride
-afraid of plane crashing