

2506/207

THEORY OF FLIGHT

June/July 2017

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**DIPLOMA IN AERONAUTICAL ENGINEERING
(AIRFRAMES AND ENGINES OPTION)**

MODULE II

THEORY OF FLIGHT

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Drawing instruments.

This paper consists of EIGHT questions.

Answer FIVE questions in the answer booklet provided.

All questions carry equal marks.

Maximum marks for each 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.**

1. (a) Explain the relationship that exists between stability and controllability of an aircraft. (8 marks)
- (b) With the aid of sketches, describe the behaviour of an aircraft in flight with respect to dynamic stability after disturbance. (12 marks)
2. (a) Outline **four** factors that affect static directional stability during flight. (4 marks)
- (b) With the aid of labelled sketches, explain how each of the following design features provide the necessary lateral stability characteristics:
- (i) dihedral wing;
 - (ii) sweep back. (16 marks)
3. (a) Outline **six** effects of exceeding estimated aircraft speed limitations. (6 marks)
- (b) Describe the manoeuvre envelope (V - n diagram) as applied in aircraft manoeuvres. (6 marks)
- (c) Explain the **four** phases of an international spin manoeuvre. (8 marks)
4. (a) Explain **three** reasons why whole aircraft may be incapable of using the highest angle of attack. (3 marks)
- (b) With the aid of a sketch, describe the main axes of an aircraft. (17 marks)
5. With the aid of a labelled sketch, explain why helicopters are fitted with each of the following hinges:
- (a) flapping; (10 marks)
 - (b) dragging. (10 marks)
6. (a) With the aid of a labelled sketch, explain the function of each part of the convectional tail rotor mechanism. (6 marks)
- (b) Explain **two** methods used to prevent helicopters to fly with the stick permanently offset. (4 marks)
- (c) With the aid of a labelled sketch, explain how drift is compensated in a single rotor helicopter. (10 marks)
7. With the aid of a labelled sketch, explain the procedure of entering into each of the following loop manoeuvres from a straight and level flight:
- (a) outside;
 - (b) inside. (20 marks)

8. (a) List **four** possible causes of uncoordinated flight. (4 marks)
- (b) Explain how uncoordinated turn is manifested to the crew. (5 marks)
- (c) Describe how the pitching moments are maintained in flight. (11 marks)

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