2506/207
THEORY OF FLIGHT
June/July 2019
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN AERONAUTICAL ENGINEERING

MODULE II

THEORY OF FLIGHT

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
Answer booklet;
Drawing instruments;
Mathematical table/Non-programmable scientific calculator.
*This paper consists of **EIGHT** questions.*
*Answer **FIVE** questions in the answer booklet provided.*
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.

Turn over

1. (a) Describe each of the following aircraft manoeuvres:

(i) climbing turn;

(ii) descending turn. (8 marks)

(b) An aircraft of 12,000 kg mass climbs at an angle of 10° to the horizontal with a speed of 110 knots along its line of flight. If the drag at this speed is 36.0 kN, determine:

(i) power used in overcoming drag;

(ii) power used in overcoming the force of gravity;

(iii) total power required for the climb. (6 marks)

(c) A jet aircraft with a wing loading of 2.4 kN/m^2 and a mass of 4,500 kg has a maximum thrust of 30 kN at sea level. If the drag coefficient at a speed of 270 knots is 0.04, determine:

(i) maximum possible rate of climb;

(ii) greatest angle of climb at this speed. (6 marks)

2. With the aid of labelled sketches, differentiate between the construction and operation of plain and slotted trailing edge flaps. (20 marks)

3. (a) Outline **five** variable factors that increase the static stability of an aircraft. (5 marks)

(b) With the aid of labelled sketches, describe each of the following features which enhance aircraft lateral stability:

(i) dihedral; (8 marks)

(ii) anhedral. (7 marks)

4. Describe each of the following forces with reference to helicopters:

(a) torque; (8 marks)

(b) gyroscopic precession. (12 marks)

5. With the aid of labelled sketches, describe each of the following methods of balancing control surfaces:

(a) mass; (12 marks)

(b) aerodynamic. (8 marks)

6. (a) (i) When there is no wind, a certain aircraft can glide engine off a horizontal distance of 1.5 nautical miles for every 1,000 ft of height. Determine the gliding angle. (5 marks)

(ii) Calculate the gliding angle and horizontal distance travelled per 1,000 ft of height if the aircraft in question a (i) glides against a head wind of 20 knots and the airspeed during the glide is 60 knots. (5 marks)

(b) Discuss aircraft ceiling with reference to aircraft performance. (10 marks)

7. (a) Explain the effect of each of the following on aircraft climb performance:

(i) altitude;

(ii) mass;

(iii) flap setting;

(iv) wind component. (12 marks)

(b) Explain the effect of weight on aircraft descent. (8 marks)

8. With the aid of labelled sketches of a swept back wing at stall, explain:

(a) The causes of pitch up; (8 marks)

(b) Each of the following methods of alleviating pitch up:

(i) wash out;

(ii) wing fences;

(iii) vortex generators;

(iv) saw tooth leading edge. (12 marks)

THIS IS THE LAST PRINTED PAGE.