

2506/302

FLIGHT MECHANICS

Oct./Nov. 2019

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN AERONAUTICAL ENGINEERING
(AIRFRAMES AND ENGINES OPTION)

MODULE III

FLIGHT MECHANICS

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.

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.

1. (a) Explain **two** reasons why skip re-entry method is used by a space shuttle. (7 marks)
- (b) With the aid of a labelled sketch, discuss ship re-entry method for a space shuttle. (13 marks)
2. (a) Outline **five** serviceability checks done on airspeed indicator and pressure supply system before flight. (5 marks)
- (b) Explain **four** signal transmission techniques from the sensor to display on aircraft instruments. (11 marks)
- (c) Explain **four** reasons for acceleration errors are minimal in the electric artificial horizon. (4 marks)
3. With the aid of a labelled sketch, discuss the design and development of a scram jet. (20 marks)
4. (a) Explain **eight** characteristics of delta wing that makes it more advantageous over swept back wings. (8 marks)
- (b) With the aid of a labelled sketch, show the effect of sweep back on critical mach No. (3 marks)
- (c) Discuss the control of boundary layer outflow on high speed aircraft. (9 marks)
5. (a) State the test plan requirements done before flight testing on a new aircraft. (2 marks)
- (b) Explain the reason for conducting a flight test on a new aircraft before acceptance by a commercial aircraft operators. (5 marks)
- (c) Highlight the key players that participate on a test flight in an aircraft production line. (9 marks)
- (d) Explain the stability checks carried out during test flight on a light aircraft. (4 marks)
6. With the aid of a labelled sketch and a graph, explain the pressure distribution and changes that take place along the flow in a pipe. (20 marks)
7. With the aid of labelled sketches, explain the effects of the compression at the wing/fuselage junction on sweepback wings. (20 marks)

8. (a) With the aid of a labelled sketch, explain Keplers' first law of planetary motion. (4 marks)
- (b) With the aid of a labelled sketch, explain the earth's and moons zone of influence. (8 marks)
- (c) Discuss the behaviour of a projectile launched horizontally along the horizon of the earth for 8,000 meters per second above the earth's surface. (8 marks)

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