

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. ✓  
6. (a) Explain **two** reasons why skip re-entry method is used by a space shuttle. (7 marks) 3.
- (b) With the aid of a labelled sketch, discuss ship re-entry method for a space shuttle. (13 marks) 3.
2. 6. (a) Outline **five** serviceability checks done on airspeed indicator and pressure supply system before flight. (5 marks) 3.
- (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.
3. x With the aid of a labelled sketch, discuss the design and development of a scram jet. (20 marks)
4. 3. (a) Explain **eight** characteristics of delta wing that makes it more advantageous over swept back wings. (8 marks) 5.
- (b) With the aid of a labelled sketch, show the effect of sweep back on critical mach No. 2. (3 marks)
- (c) Discuss the control of boundary layer outflow on high speed aircraft. (9 marks)
5. x (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. 10. 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) 10.
7. x With the aid of labelled sketches, explain the effects of the compression at the wing/fuselage junction on sweepback wings. (20 marks)

$$V = \sqrt{9.81 \times 6370^2}$$

8.  
11

- (a) With the aid of a labelled sketch, explain Keplers' first law of planetary motion. (4 marks) 3
- (b) With the aid of a labelled sketch, explain the earth's and moons zone of influence. (8 marks) 4
- (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) 4

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