

2506/107
2507/107
AIRCRAFT PISTON ENGINES
Oct./Nov. 2023
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL
DIPLOMA IN AERONAUTICAL ENGINEERING
(AIRFRAMES AND ENGINES OPTION)
DIPLOMA IN AERONAUTICAL ENGINEERING
(AVIONICS OPTION)

MODULE I

AIRCRAFT PISTON ENGINES

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Drawing instruments;

Mathematical tables/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.

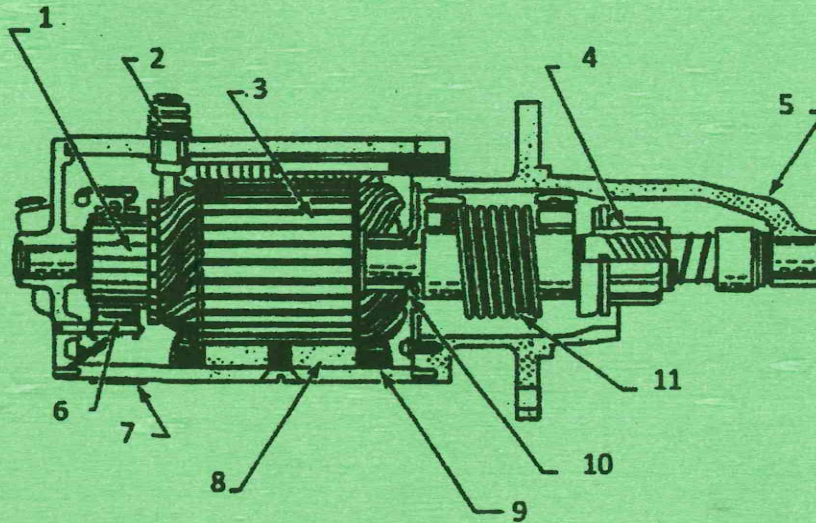
This paper consists of 4 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

1. (a) Outline the contribution for each of the following in the historical development of modern piston engines:
- (i) Denis Papin;
 - (ii) Thomas Newcomen. (4 marks)
- (b) Highlight **four** major factors that need to be considered in the design and construction of a reciprocating engine piston. (4 marks)
- (c) With the aid of a labelled cross sectional sketch, explain the construction of a reciprocating engine piston. (12 marks)
2. (a) Describe the difference between the operation of a two stroke and four stroke cycle engines. (8 marks)
- (b) Determine the piston displacement of a 14 cylinder engine with a cylinder diameter and stroke of 5.52 inch and 5.5 inch respectively. (5 marks)
- (c) Using sketches of clear containers, show **five** ways of visually examining and interpreting stored fuel on regular basis for signs of contamination before use on an aircraft as a safety measure. (7 marks)
3. (a) With the aid of a labelled sketch, explain the application and operation of an induction system waste gate. (10 marks)
- (b) Outline the procedure of installing a new carburettor on an aircraft engine. (10 marks)

4. (a) With reference to figure 1:

- (i) Name the component. (½ mark)
- (ii) Label the parts 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11. (5½ marks)
- (iii) Explain its operation. (4 marks)



(b) Reciprocating engine parts are to be checked for flaws before assembly using fluorescent penetrants. Outline the:

- (i) application of this technique; (6 marks)
- (ii) **four** personal safety precautions to be observed. (4 marks)

5. (a) Using a block diagram, show and label the components layout and direction of flow for an aeropiston engine dry sump oil system. (11 marks)

(b) With reference to aeropiston engine cooling systems:

- (i) compare between liquid and air cooling. (4 marks)
- (ii) discuss air cooling. (5 marks)

6. (a) With the aid of a sketch, describe the construction of an exhaust collector ring installed on a 14 cylinder radial engine. (6 marks)

(b) (i) With reference to aeropiston engine performance, highlight **six** factors that decrease volumetric efficiency. (3 marks)

(ii) Using a labelled sketch, explain the parameters that determine the compression ratio of an aeropiston engine. (11 marks)

7. (a) With reference to aeropiston engine maintenance practices, describe the operation of a remote inspection equipment NDI methods. (10 marks)
- (b) Describe the construction of each of the following parts of an aeropiston engine typical spark plug:
- (i) durable metal shell; (3 marks)
 - (ii) electrode assembly. (7 marks)
8. (a) Highlight the maintenance practices when servicing an aeropiston engine starter motor before storage. (10 marks)
- (b) With reference to the six carburettor systems:
- (i) name **four** (2 marks)
 - (ii) Highlight **two** functions for each. (8 marks)

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