

2506/107

2507/107

AIRCRAFT PISTON ENGINES

June/July 2023

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**DIPLOMA IN AERONAUTICAL ENGINEERING
(AIRFRAMES AND ENGINES OPTION)
(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 of the EIGHT questions in the answer booklet provided.

All questions carry equal marks.

Maximum marks for each part of a 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. Describe the operation of each of the four strokes of an aeropiston engine. (20 marks)
2. (a) With the aid of a labelled schematic diagram, show the layout of the components of an aeropiston engine dry sump lubrication system. (8 marks)
 - (b) Highlight six characteristics of aeropiston engine lubrication oil. (6 marks)
 - (c) Outline six maintenance practices to be carried out on the lubrication system if during flight, the indicated oil pressure is reported to be either higher or lower than normal. (6 marks)
3. (a) State three types of AVGAS fuel grades and state the identification colour for each. (3 marks)
 - (b) With the aid of a labelled sketch, describe the construction and operation of the main metering system of an aeropiston engine float-type carburettor. (17 marks)
4. (a) With reference to induction system ice formation:
 - (i) sketch and show the locations;
 - (ii) explain each type. (12 marks)
- (b) During a typical induction system trouble shooting, the following faults were isolated. Complete table 1. (8 marks)

Table 1

No.	FAULT	AREAS OF INSPECTION	MAINTENANCE PRACTICES
(i)	Induction system obstructed		
(ii)	Air leaks		
(iii)	Loose air ducts		
(iv)	Leaking intake pipes		

5. (a) Highlight the procedure for performing a pre-ground run on a typical aeropiston engine. (8 marks)
- (b) Discuss each of the following engine operation monitoring instruments:
 - (i) fuel pressure indicator;
 - (ii) carburettor air temperature (CAT) indicator;
 - (iii) tachometer indicator. (12 marks)

6. (a) With the aid of a labelled sketch, describe the construction of the primary electrical circuit of a high tension magneto. (13 marks)
- (b) Outline the procedure for aeropiston engine ignition lead replacement. (7 marks)
7. (a) With the aid of labelled sketches, show the impulse coupling at each of the following positions:
- (i) as the starter begins to rotate the crankshaft; (4 marks)
- (ii) when the piston is near the top dead center. (3 marks)
- (b) **Figure 1** represents a combined hand and electric starter for a small aeropiston engine.

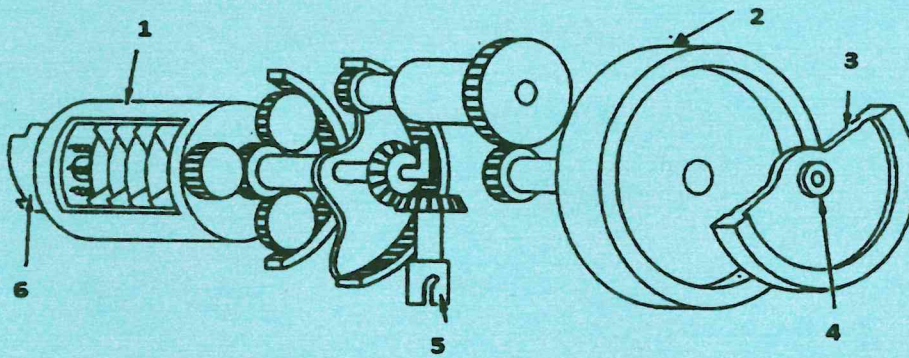


Fig. 1

- Identify the parts labelled 1,2,3,4,5 and 6. (3 marks)
- (c) Discuss the aeropiston engine starting system maintenance practices. (10 marks)
8. (a) With reference to aeropiston engine piston rings:
- (i) sketch and show the positions for each;
- (ii) explain the installation and function for each. (9 marks)
- (b) With the aid of a labelled cross-sectional sketch, show the valve-operating mechanism for a typical aeropiston radial engine. (11 marks)

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