

2506/107

2507/107

AIRCRAFT PISTON ENGINES

June/July 2022

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 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.**

1. (a) Outline **five** advantages of a liquid cooled aircraft engine. (5 marks)
- (b) With reference to the reciprocating engine cylinder head temperature indicating system:
- (i) describe the construction; (5 marks)
- (ii) discuss the inspection and maintenance. (10 marks)
2. (a) With the aid of a labelled schematic flow diagram, show the reciprocating engine pressure filtration sub-system. (8 marks)
- (b) Outline **five** characteristics of a piston engine lubricating oil. (5 marks)
- (c) With reference to aeropiston engine lubrication system maintenance:
- (i) list **six** contaminants of lubricating oil; (3 marks)
- (ii) outline **four** precautions to be observed when changing the lubricating oil from straight mineral oil to ashless dispersant oil. (4 marks)
3. With reference to aviation fuels:
- (a) explain **six** fuel additives; (12 marks)
- (b) describe **four** types of aviation fuels. (8 marks)
4. (a) Describe the construction of a piston for a reciprocating engine. (10 marks)
- (b) With the aid of a labelled sketch, show the parts of a plain connecting rod assembly. (5 marks)
- (c) Given:
- Indicated mean effective pressure (P) = 165 lb/in^2 ;
 - Stroke (L) = 6 inch;
 - Bore = 5.5 inch;
 - RPM = 3,000;
 - No. of cylinders (K) = 12.
- Determine the indicated horsepower (IHP). (5 marks)
5. (a) Show the typical fuel/air mixture curve for a float - type carburetor. (8 marks)
- (b) Explain the main carburetor subsystems. (12 marks)

6. (a) With reference to induction system troubleshooting during maintenance, fill in the spaces shown in table 1.

(12 marks)

Table 1

Probable Cause	Isolation Procedure	Corrective action
(i)Engine fails to start		
(I)Induction system obstructed		
(II)Air leaks		
(ii)Engine runs rough		
(I)Loose air duct		
(II)Leaking intake pipes		
(III)Engine valves sticking		
(IV)Bent or worn valve push rods		
(iii)Low power		
(I)Restricted intake duct		
(II)Broken door in carburetor air valve		
(III)Dirty air filter		
(iv)Engine idles improperly		
(I)Shrunken intake packing		
(II)Hole in the intake pipe		
(III)Loose carburettor mounting		

- (b) Describe the construction and operation of a non-supercharged induction system.

(8 marks)

7. (a) With the aid of a circuit diagram, describe the construction of an aircraft battery ignition system.

(11 marks)

- (b) Explain the operation of the booster coil as an auxiliary ignition system unit.

(9 marks)

8. (a) Differentiate between each of the following defects on aeropiston engine parts:

- (i) abrasion and brinelling;
- (ii) burning and burnishing;
- (iii) chafing and chipping;
- (iv) cut and dent.

- (b) Outline six reasons for cylinder replacement during maintenance.

(8 marks)

(6 marks)

- (c) Highlight the procedure for aero-piston engine cylinder removal.

(6 marks)

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