

2506/107

2507/107

PISTON ENGINES

June/July 2017

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**DIPLOMA IN AERONAUTICAL ENGINEERING
(AIRFRAMES AND ENGINES OPTION)
DIPLOMA IN AERONAUTICAL ENGINEERING
(AVIONICS OPTION)**

MODULE I

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) Explain the function of each of the following reciprocating engine components:
- (i) crankcase; ✓
 - (ii) crankshaft; ✓
 - (iii) camshaft; ✓
 - (iv) cylinder. ✓ (10 marks)
- (b) Outline **four** requirements of a cylinder used in aeropiston engines. ✓ (4 marks)
- (c) Explain the function of each of the three piston rings. ✓ (6 marks)

2. ✓
- With the aid of a labelled sketch:
- (a) show Otto cycle on a P-V diagram; ✓ (8 marks)
 - (b) describe the valve timing of a typical aeropiston engine. ✓ (12 marks)

3. ✓
- With the aid of labelled sketches, differentiate between throttle and impact ice in the aeropiston induction system. ✓ (20 marks)

4. ✓
- (a) Outline **four** factors that decrease the volumetric efficiency of a piston engine. ✓ (4 marks)
- (b) Given piston displacement of a cylinder engine with a 5.5 inch diameter bore, 5.5 inch stroke, mean effective pressure of 1.65 pounds per square inch, revolutions per minute of 3,000 and a torque of 800 pound feet; determine each of the following:
- (i) piston displacement; ✓
 - (ii) indicated horse power; ✓
 - (iii) brake horse power; ✓
 - (iv) brake mean effective pressure. ✓ (16 marks)

5. With the aid of labelled sketches, describe the construction and operation of each of the following induction system:
- (a) self aspirated; (10 marks)
 - (b) supercharged. (10 marks)

6. ✓ (a) Highlight the procedure for setting an ignition timing for an aeropiston engine. (4 marks)
- (b) Discuss each of the following aeropiston engine spark plug fouling:
- (i) carbon; ✓
 - (ii) oil; ✓
 - (iii) lead; ✓
 - (iv) graphite. ✓ (16 marks)
7. ✓ (a) Explain each of the following properties of aeropiston lubricating oil:
- (i) viscosity index; ✓
 - (ii) flash point and fire point; ✓
 - (iii) cloud point and pour point; ✓
 - (iv) specific gravity. ✓ (8 marks)
- (b) With the aid of a labelled block diagram, describe the construction and operation of a dry sump lubrication system for an aeropiston engine. (12 marks)
8. Describe each of the following aeropiston engine instruments:
- (a) carburetor air temperature; (4 marks)
 - (b) fuel pressure indicator; (4 marks)
 - (c) oil pressure indicator; (4 marks)
 - (d) fuel flow meter; (4 marks)
 - (e) tachometer. (4 marks)

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