2506/107
2507/107
AIRCRAFT PISTON ENGINES
Oct./Nov. 2021
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.
*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 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.

Turn over

1. (a) Explain the formation of each of the following tubes of carburetor icing:

(i) fuel;
(ii) throttle.

(8 marks)

(b) With the aid of a labelled cross sectional diagram, show a fuel injector nozzle for an aeropiston engine. (5 marks)

(c) Outline the procedure for starting an aircraft engine equipped with an RSA fuel injection system. (7 marks)

2. With the aid of a labelled sketch, show and explain a typical aeropiston engine valve timing. (20 marks)

3. (a) With the aid of a schematic sketch, explain the operation of a typical aeropiston engine battery ignition system. (16 marks)

(b) With reference to aeropiston engine ignition system, explain each of the following terms:

(i) magnetic flux;
(ii) electrical steel;
(iii) permeability;
(iv) retentivity.

(4 marks)

4. (a) With the aid of a labelled sketch, explain heat dissipation in aeropiston engine valves. (7 marks)

(b) Explain each of the following with reference to AVGAS safety:

(i) fire extinguishing;
(ii) spillage;
(iii) health;
(iv) bonding.

(4 marks)

(c) With reference to turbocharged induction system, highlight **three** probable causes for each the following defects:

(i) aircraft fails to reach critical attitude;
(ii) engine surges;
(iii) waste gate will not close fully.

(9 marks)

5. (a) With reference to aeropiston engine, discuss each of the following:

(i) coring as applied to aircraft lubrication systems; (4 marks)

(ii) over-dilution. (3 marks)

(b) With the aid of labelled sketches, explain the operation of a typical aeropiston engine oil cooler. (13 marks)

6. With the aid of labelled sketches:

(a) show the operational difference between a spur gear and a gerotor type pump. (6 marks)

(b) explain the principle of operation of a typical aeropiston engine turbo-charger hydraulically operated wastegate. (14 marks)

7. (a) With reference to aeropiston engine, explain each of the following:

(i) compression ratio;
(ii) brake horse power (BHP);
(iii) overlap;
(iv) port;
(v) safety gap;
(vi) thermo siphon.

(6 marks)

(b) Explain each for the following causes of detonation:

(i) incorrect mixture strength;
(ii) temperature and pressure of mixture;
(iii) design features.

(10 marks)

(c) With reference to aeropiston engine oil weighing system:

(i) explain the function;
(ii) highlight the components.

(4 marks)

8. With reference to aeropiston engines:

(a) outline the procedure of performing each of the following maintenance operations;

(i) valve lapping;
(ii) leak testing.

(8 marks)

(b) Explain top overhaul. (3 marks)

(c) Highlight **two** main functions of the engine cowling. (2 marks)

(d) Discuss the common faults on turbocharged engine exhaust systems. (7 marks)

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