

2107/306

AIRCRAFT PROPULSION

Oct./Nov. 2008

Time: 3 hours

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

AIRCRAFT PROPULSION

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet

Drawing Instruments

Answer any FIVE of the following EIGHT questions.

All questions carry equal marks.

Maximum marks for each part of a question are indicated.

This paper consists of 3 printed pages.

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

1. (a) Outline **five** aerogas turbine engine fuel system requirements for optimum performance. (5 marks)
- (b) State **four** methods of varying the fuel flow to the burners through the servo systems in the aerogas turbine engines. (4 marks)
- (c) With the aid of sketches explain the **three** operation positions of a servo pressure controlled valve in aero engine fuel system. (11 marks)
2. With the aid of a pressure volume diagram and across-sectional sketch explain the construction and operation of a triple spool, front fan aircraft gas turbine engine. (20 marks)
3. (a) Outline **four** major aeropiston engine cylinder assembly designs and construction factors to be considered. (4 marks)
- (b) With the aid of a labelled sketch explain the construction and operation of a radial aeropiston engine valve operating mechanism. (16 marks)
4. In a propeller driven aircraft engine:
 - (a) Discuss **three** methods of increasing the effective blade area; (6 marks)
 - (b) Explain **three** fundamental means of controlling the blade angle variation in a constant speed propeller operation; (6 marks)
 - (c) Compare the reactive forces between a propeller and an aerofoil. Illustrate your answers. (8 marks)
5. (a) Discuss the term condition monitoring as applied to aeroengine maintenance. (4 marks)
- (b) Outline **five** methods for on condition monitoring techniques. (5 marks)
- (c) Write in itemised format the procedure to be followed when carrying out the following inspection methods:
 - (i) dye penetrant;
 - (ii) magnetic particle (Magnaflux). (11 marks)
6. (a) Describe each of the following terms as applied to aircraft self contained recirculatory lubricating oil systems.
 - (i) pressure relief valve;
 - (ii) full flow. (4 marks)

- (b) Write short notes on the following aircraft engine lubricating oil characteristics:
- (i) flash point;
 - (ii) cloud point;
 - (iii) viscosity. (6 marks)
- (c) (i) Outline **four** advantages of wet sump over dry sump aircraft engine oil lubricating systems;
- (ii) Discuss the importance of the following components in an aeroengine lubrication systems:
- (I) centrifugal breather;
 - (II) low Pressure fuel cooled oil cooler;
 - (III) oil bypass valve. (10 marks)
7. (a) Explain the operation of the Magneto in an aeropiston engine ignition system. (4 marks)
- (b) Describe how the production of electrical voltage is achieved in a multi-pole magneto rotating in the gap between a two pole shoes. Illustrate your answers. (6 marks)
- (c) With the aid of sketches explain the principle operation of the following aeroengine devices:
- (i) thermocouple;
 - (ii) electrical starter motor. (10 marks)
8. (a) Outline the functions of the convergent divergent propelling nozzle in a gas turbine engine with reheat system. (5 marks)
- (b) Discuss **three** methods of noise suppression in aero gas turbine engines. (6 marks)
- (c) (i) Differentiate between the terms thrust reversal and reheat as applied to aerogas turbine engines;
- (ii) Explain how the static and flight condition thrust can be determined in aerojet engines. (9 marks)