

2506/304
GAS TURBINE ENGINES
Oct./Nov. 2022
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**DIPLOMA IN AERONAUTICAL ENGINEERING
(AIRFRAME AND ENGINES OPTION)**

MODULE III

GAS TURBINE 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 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. (a) With the aid of a labelled sketch, describe the construction and operation of the duple spray nozzle. (12 marks)
- (b) Outline the logical trouble shooting sequence applied in a gas turbine engine maintenance. (8 marks)
2. With the aid of labelled sketches, show the:
 - (a) layout of a typical jet engine afterburner control system; (10 marks)
 - (b) designated jet engine ground running danger zones in feet during normal and reverse thrust condition; (8 marks)
 - (c) describe the construction and application of ball bearings in gas turbine engines. (2 marks)
3. (a) With the aid of a labelled cross-sectional sketch, show the construction of a high pressure hose assembly. (4 marks)
- (b) Highlight **eight** precautions to be observed during the installation of flexible pipes. (8 marks)
- (c) Explain each of the following gas turbine engine supervisory controls:
 - (i) electronic control;
 - (ii) electronic control amplifiers;
 - (iii) engine supervisory control;
 - (iv) full authority digital control. (8 marks)
4. With the aid of a labelled circuit diagram, explain the sequence of events during the operation and testing of a two-wire thermal switch fire detector system. (20 marks)
5. (a) With the aid of a labelled sketch, discuss the principle of operation of a centrifugal flow compressor. (10 marks)
- (b) With the aid of a labelled block diagram, explain the operation of a vibration indicator. (10 marks)
6. (a) Discuss the operation of jet engine thrust reverse system. (10 marks)
- (b) With the aid of a labelled sketch, explain the operation of a turbo rocket engine. (10 marks)

7. (a) With the aid of a labelled block diagram, explain the operation of an aero gas turbine engine pressure relief valve lubrication system. (14 marks)
- (b) With the aid of a labelled sketch, explain the term chocked nozzle as applied to turbo jet engine intakes. (6 marks)
8. (a) Explain each of the following gas turbine engine ignition mode of operation:
- (i) ground start; (2 marks)
 - (ii) in-flight start; (4 marks)
 - (iii) continuous ignition; (4 marks)
 - (iv) automatic ignition. (3 marks)
- (b) Describe the **three** primary maintenance processes of an aircraft. (7 marks)

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