2506/304
GAS TURBINE ENGINES
Oct. / Nov. 2017
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN AERONAUTICAL ENGINEERING (AIRFRAMES & ENGINES OPTION)

MODULE III

GAS TURBINE ENGINES

3 hours

INSTRUCTIONS TO CANDIDATES

You should have drawing instruments for this examination.
*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 part of a 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.

Turn over

1. (a) Outline **four** advantages and **four** disadvantages of an axial flow compressor. (8 marks)

(b) With the aid of labelled sketch, discuss the construction and operation of a triple spool high bypass ratio turbo fan engine. (12 marks)

2. (a) Outline **four** requirements of a gas turbine engine combustor section. (4 marks)

(b) With the aid of labelled sketches, show:

(i) the parts of a combustion chamber;

(ii) apportioning of airflow through the combustion chamber. (16 marks)

3. (a) Discuss why anti-friction bearings are preferred for use on gas turbine engines. (8 marks)

(b) With the aid of a labelled sketch, explain the construction and operation of a simplex nozzle used on a gas turbine engine. (6 marks)

(c) Illustrate the fuel flow pattern on a nozzle at low, intermediate and high fuel pressure. (6 marks)

4. (a) With the aid of labelled sketches, explain the difference in construction of a supersonic and a subsonic exhaust duct. (10 marks)

(b) With the aid of a sketch, explain the changes in pressure and velocity through a centrifugal flow compressor. (10 marks)

5. (a) With the aid of a labelled sketch, describe the construction and operation of a reheat system used for thrust augmentation on jet engines. (8 marks)

(b) Illustrate the construction layout and operation of each of the following reverse thrust methods:

(i) clamshell;
(ii) bucket;
(iii) cold stream.

(12 marks)

6. With reference to a gas turbine engine fire detection system:

(a) outline the design features; (10 marks)

(b) explain **five** possible causes of fault and state the remedies. (10 marks)

7. With the aid of sketches, explain the construction and operation of kinetic valve used on gas turbine engine fuel system. (20 marks)

8. (a) With the aid of a sketch, explain the construction of a gear type pump used on gas turbine lubrication system. (11 marks)

(b) Highlight the typical procedure of removing, cleaning and replacement of a gas turbine engine oil filter. (5 marks)

(c) Explain the function of **four** components found on a gas turbine engine wet sump lubrication system. (4 marks)

THIS IS THE LAST PRINTED PAGE.