

2506/304
GAS TURBINE ENGINES
June/July 2020
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 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 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.

1. (a) With the aid of a P-V diagram, explain the Bryton's cycle. (9 marks)
- (b) Outline **three** factors that determine thrust produced by a turbofan engine. (3 marks)
- (c) Determine the amount of gross thrust produced by turbojet aircraft from rest with 50 pounds of air moving through the engine every second producing an exhaust velocity of 1,300 feet per second.
(Take $g = 32.2 \text{ ft/sec}^2$) (4 marks)
- (d) Calculate the net thrust of the aircraft in 1(c) after take-off if the aircraft was flying at 500 miles per hour. (4 marks)

2. With the aid of labelled sketches, explain each of the following with reference to aircraft gas turbine engines:

- (a) principle of operation; (11 marks)
- (b) cascade effect. (9 marks)

3. (a) Discuss each of the following methods of augmenting thrust on aerogas turbine engine:

- (i) water injection;
- (ii) after burners. (8 marks)

(b) With the aid of a labelled sketch, explain the principle of operation of a variable supersonic inlet duct. (12 marks)

4. (a) Figure 1 shows a schematic diagram of a typical turbofan engine system.

- (i) identify the system;
- (ii) explain the systems operation. (14 marks)

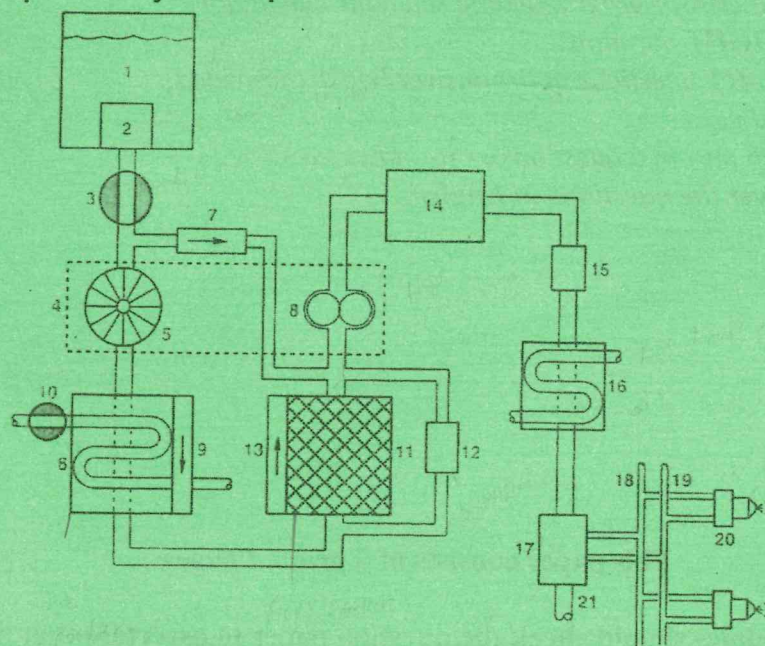


Fig. 1

(b) Discuss the full authority digital electronic control (FADEC) with reference to gas turbine engine fuel system. (6 marks)

5. (a) Discuss the function of each of the three gas turbine engine lubrication sub-systems. (9 marks)

(b) Describe two types of seals used in gas turbine engine lubrication system. (11 marks)

6. (a) Outline the items to be checked during each of the following typical routine inspection on an aircraft gas turbine engine:

(i) pre-flight; (6 marks)

(ii) hot section. (8 marks)

(b) Highlight six basic rules of safe tying of fasteners during aircraft gas turbine engine maintenance. (6 marks)

7. With the aid of a sketch, describe the operation of aerogas turbine rate-of-temperature rise fire detection system. (20 marks)

8. (a) Discuss the safety considerations before performing a typical aircraft gas turbine engine starting sequence. (6 marks)

(b) With the aid of a sketch, explain the operation of an air turbine starter. (14 marks)

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