2507/304
AIRCRAFT COMMUNICATION, SURVEILLANCE
AND NAVIGATION SYSTEMS
June/July 2019
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN AERONAUTICAL ENGINEERING (AVIONICS OPTION)

MODULE III

AIRCRAFT COMMUNICATION, SURVEILLANCE
AND NAVIGATION SYSTEMS

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
Answer booklet;
Drawing instruments;
Mathematics/non programmable calculator.
*This paper consists of **EIGHT** questions in **THREE** sections; **A, B** and **C**.*
*Answer **THREE** questions from section **A**, **ONE** question from section **B** and **ONE** question from section **C**.*
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.

SECTION A: NAVIGATION

*Answer **THREE** questions from this section.*

1. (a) Discuss each of the following basic types of antennas used in aviation:

   (i) dipole; (5 marks)
   (ii) marconi; (5 marks)
   (iii) loop. (5 marks)

   (b) Explain how polarization, directivity and field patterns affect antennas. (5 marks)

2. (a) With the aid of a labelled sketch, describe the microwave landing system ground facilities. (12 marks)

   (b) With the aid of a labelled block diagram, show the operation of a localizer receiver. (8 marks)

3. (a) Discuss the principle of operation and design requirements for VHF navigation systems. (13 marks)

   (b) With the aid of a labelled sketch, illustrate a typical VHF block diagram. (7 marks)

4. With the aid of a labelled schematic diagram, describe the operation of an aircraft global positioning satellite navigation system. (20 marks)

SECTION B: AIRCRAFT COMMUNICATION

*Answer **ONE** question from this section.*

5. (a) With the aid of sketches, differentiate between each of the following:

   (i) amplitude modulation and frequency modulation;

   (ii) analogue and digital signal. (10 marks)

   (b) With the aid of a labelled block diagram, show the operation of a simplified aircraft radio transmitter. (10 marks)

6. (a) Outline **four** main components of a modern aircraft flight management system. (4 marks)

(b) Explain the characteristics of a typical aircraft attendants handset. (3 marks)

(c) Highlight the procedure of performing full function check on the cockpit voice recorder during routine maintenance. (13 marks)

SECTION C: SURVEILLANCE

*Answer **ONE** question from this section.*

7. (a) Outline **eight** factors considered in the design of an ATC surveillance system according to ICAO regulations. (8 marks)

(b) Explain the operation of a primary surveillance radar. (10 marks)

(c) Explain tropospheric scatter as applied in aircraft surveillance systems. (2 marks)

8. (a) Outline the installation requirements for emergency locator transmitter on fixed wing aircraft and rotocraft. (8 marks)

(b) Highlight **three** operational characteristics of an F, or AF type of aircraft emergency locator transmitter. (3 marks)

(c) Explain the maintenance and tests that are carried out on an emergency locator transmitter. (9 marks)

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