

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)
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LLZ*
- (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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