2507/304
AIRCRAFT COMMUNICATION,
SURVEILLANCE AND NAVIGATION SYSTEMS
June/July 2017
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;*
*Mathematical tables/Non-programmable Scientific calculator;*
*Drawing Instruments.*
*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.**

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## SECTION A: AIRCRAFT NAVIGATION SYSTEMS

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

1. (a) Explain **five** limitations of an instrument landing system compared to microwave landing system. (10 marks)

(b) Describe the principle of operation of an instrument landing system. (10 marks)

2. With the aid of a labelled block diagram, explain the function of each component of a basic radar system. (20 marks)

3. (a) Determine the elapsed time after successive interrogations for an aircraft approaching a beacon at 300 knots if the track rate is 20 pp/sec. (3 marks)

(b) Explain **three**:

(i) functions of interrogator in a distance measuring unit;

(ii) ground beacons co-located with distance measuring equipment transponders. (6 marks)

(c) With the aid of a labelled block diagram, show the basic components of an automatic direction finder system. (5 marks)

(d) Explain each of the following distance equipment modes:

(i) search;

(ii) track;

(iii) memory. (6 marks)

4. (a) Highlight **four** functions of the flight management system. (4 marks)

(b) Discuss flight management computer system as applicable to aircraft performance. (8 marks)

(c) Highlight the procedure of testing an aircraft communication radio. (8 marks)

## SECTION B: AIRCRAFT COMMUNICATION SYSTEMS

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

5. (a) With the aid of a labelled block schematic diagram of a communication system receiver:

(i) show the reception process;

(ii) explain **three** requirements. (9 marks)

(b) Describe **four** parameters that determine how effective a receiver is, in meeting its requirements. (8 marks)

(c) Determine the:

(i) frequency of a radio installation working with a wavelength of 10 cm;

(ii) wavelength of VHF broadcast of 90 Mhz. (3 marks)

6. (a) Outline **six** requirements considered when mounting avionics equipment. (6 marks)

(b) Discuss the maintenance safety aspects of a radome on an aircraft. (14 marks)

## SECTION C: AIRCRAFT SURVEILLANCE SYSTEMS

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

7. (a) With the aid of a labelled sketch, explain how troposcatter occurs. (8 marks)

(b) Explain 'range tracking' as applied in aircraft surveillance. (5 marks)

(c) Describe the principle of operation of an emergency locator transmitter used on an aircraft. (7 marks)

8. (a) Describe the operation and requirements of an emergency locator transmitter in accordance with ICAO. (9 marks)

(b) Highlight the **six** traffic alert and collision avoidance system equipment. (3 marks)

(c) Differentiate between each of the following as applied to traffic alert and collision avoidance systems:

(i) advisory and alert;

(ii) caution area and collision area;

(iii) other traffic and proximate traffic;

(iv) corrective and preventive advisory. (8 marks)

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