2507/304
AIRCRAFT COMMUNICATION, SURVEILLANCE
AND NAVIGATION SYSTEMS
Oct./Nov. 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;
Mathematical tables/Non programmable 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.

Turn over

SECTION A: NAVIGATION

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

1. Discuss length as a major characteristic of aircraft antennas under each of the following headings:

   (a) relationship between AC signal and frequency; (10 marks)

   (b) the methods and reasons for antennas length adjustment. (10 marks)

2. (a) Discuss the function and principle of operation of a DME. (5 marks)

   (b) Describe the operation of a DME transponder. (15 marks)

3. With the aid of a labelled sketch, discuss the principle of operation of Time Referenced Scanning Beam (TRSB) in microwave landing system. (20 marks)

4. (a) Explain **three** ways of minimizing errors arising due to a change in phase offset in hyperbolic radio navigation. (6 marks)

   (b) With the aid of a labelled sketch, discuss the principle of operation of a pulsed hyperbolic radio navigation system. (14 marks)

SECTION B: AIRCRAFT COMMUNICATION

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

5. (a) Highlight the aircraft radio systems installation requirements. (10 marks)

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

6. (a) Define flight management system as applied in aviation. (2 marks)

   (b) Outline **eight** main components of aircraft passenger entertainment audio system. (4 marks)

   (c) Highlight the cockpit voice recorder requirements according to ICAO. (14 marks)

SECTION C: SURVEILLANCE

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

7. (a) Explain **six** characteristics of a surveillance system in accordance with ICAO Regulations. (9 marks)

(b) Describe the application of an aircraft secondary surveillance radar system with "MODE S" transponder. (11 marks)

8. (a) Describe the TCAS II aircraft emergency system. (9 marks)

(b) With the aid of a labelled block diagram, show the supply from water switch providing outputs at VHF 121.5 mHz and 243 mHz for a type-W emergency locator transmitter. (11 marks)

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