

2507/304

**AIRCRAFT COMMUNICATION SURVEILLANCE  
AND NAVIGATION SYSTEMS**

Oct./Nov. 2018

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;*

*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.*

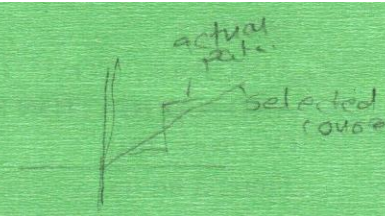
*Candidates should answer the questions in English.*

**This paper consists of 4 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) Define automatic direction finding as applied in aircraft navigation. (1 mark)
  - (b) With the aid of a labelled sketch, explain **four** effects of using VOR below the line of sight with reference to range and accuracy. (7 marks)
  - (c) Describe distance measuring equipment under each of the following headings:
    - (i) frequencies;
    - (ii) principle of operation; ✓
    - (iii) range;
    - (iv) accuracy;
    - (v) distance display. - distance info in nautical miles
- (12 marks)
- Handwritten notes for (c): 1030-1059 MHz, 4133 Hz
2. With the aid of a labelled sketch, describe the principle of operation and installation of a typical marker beacon used for instrument landing system. (20 marks)
  3. With the aid of a block diagram, explain the function of each stage of a continuous wave transmitter. (20 marks)
  4. (a) With the aid of a block diagram of a typical GPS avionics receiver fitted on the fuselage, show the signal flow. (11 marks)
  - (b) With reference to the global positioning system:
    - (i) explain the principle of operation;
    - (ii) outline **three** system segments.
    - (iii) list **three** types of information provided to the users.
- (9 marks)

Handwritten notes:

- On dashes B 400Hz
- MM dashes 1300Hz
- IM dashes 3000Hz
- Mass code
- VHF 5-7W
- Supplex
- Display I-F AMP
- Mixers



## SECTION B: COMMUNICATION

Answer *ONE* question from this section.

5. (a) Correct operation of the transceiver can be checked by means of various lights located on its face. State why each of the following lights may come on:
- (i) LRV FAIL warning light (LED);
  - (ii) KEY INTERLOCK warning light (LED);
  - (iii) CONTROL INPUT FAIL warning light (LED);
  - (iv) SQL/LAMP TEST push button switch.
- (8 marks)
- (b) Describe the tests carried out on VHF communication system during aircraft maintenance. (12 marks)
6. A 28,000 channel dual high frequency communication system is to be installed on a modern aircraft. Highlight the requirements and considerations under the following headings:
- (a) units; (2 marks)
  - (b) interconnections; (2 marks)
  - (c) interlocking; (6 marks)
  - (d) controller; (3 marks)
  - (e) unit locations. (7 marks)
- Hf com

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## SECTION C: SURVEILLANCE

Answer **ONE** question from this section.

7. (a) Define each of the following terms as applicable to traffic collision avoidance systems (TCAS):
- (i) collision area;
  - (ii) intruder;
  - (iii) mode A.
- (6 marks)
- (b) Describe the operation of an underwater locator beacon used on aircraft surveillance system. (9 marks)
- (c) Highlight **five** TCAS II system equipment. (5 marks)
- ✓ 8. Explain with respect to aircraft surveillance system and application advisory circular based on ICAO requirements under each of the following:
- (a) purpose for Joint Flight Standards Service (AFS) and Aircraft Certification Service (AIR) advisory circular (AC); (8 marks)
  - (b) guidance on installation; *- manual* (6 marks)
  - (c) general continuing airworthiness. (6 marks)

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