

2507/304

AIRCRAFT COMMUNICATION, NAVIGATION
AND SURVEILLANCE SYSTEMS

Oct./Nov. 2021

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN AERONAUTICAL ENGINEERING
(AVIONICS OPTION)

MODULE III

AIRCRAFT COMMUNICATION, NAVIGATION AND SURVEILLANCE SYSTEMS

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Drawing instruments;

Mathematical tables/Non-programmable scientific 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** in the answer booklet provided.*

Maximum marks for each part of a question are as shown.

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: AIRCRAFT NAVIGATION SYSTEMS

Answer **THREE** questions from this section.

1. Describe each of the following components of a simple doppler typical navigation system:
 - (a) sensor; (5 marks)
 - (b) controller; (4 marks)
 - (c) indicator; (6 marks)
 - (d) automatic chart display (ACD). (5 marks)
2.
 - (a) Highlight **eight** reasons for use of distance measuring equipment, with other navigation equipment. (8 marks)
 - (b) With reference to distance measuring equipment, discuss the relationship between slant range and horizontal range. (6 marks)
 - (c) With the aid of a labelled block diagram, show the inertia reference system single axis navigation computations. (6 marks)
3. With reference to instrument landing system:
 - (a) discuss false glideslopes; (6 marks)
 - (b) draw and label the horizontal situation indicator; (8 marks)
 - (c) explain **three** ground installation facility performance categories. (6 marks)
4.
 - (a) An aircraft is at 4 nm from touchdown flying at 3° glidepath at a groundspeed of 150 kt. Determine the height of the aircraft and rate of descent required using the 1:60 rule. (4 marks)
 - (b) With the aid of a labelled block diagram, explain the generation of RF pulses in radar systems. (8 marks)
 - (c) With the aid of labelled sketches, differentiate between each of the following with respect to VOR navigation:
 - (i) radial and bearing;
 - (ii) course and heading.(8 marks)

SECTION B: AIRCRAFT COMMUNICATION SYSTEMS

Answer ONE question from this section.

5. With the aid of a labelled simple receiver block diagram, describe a typical squelch control used in aircraft radio communication system. (20 marks)
6. (a) State **four** requirements of an audio integration system of an aircraft with two or more flight crew members and many different radio systems. (2 marks)
- (b) With the aid of a labelled diagram, describe the construction of a typical audio accessory unit used for an aircraft. (12 marks)
- (c) With reference to ground crew call system, explain each of the following:
- (i) function;
 - (ii) operational features.
- (6 marks)

SECTION C: AIRCRAFT SURVEILLANCE SYSTEM

Answer ONE question from this section.

7. With the aid of a labelled block diagram, describe the operation of TCAS II system. (20 marks)
8. With reference to aircraft surveillance system, discuss each of the following methods of operation:
- (i) radio -radar communication; (4 marks)
 - (ii) imagery; (8 marks)
 - (iii) flight information system - broadcast (FIS - B). (8 marks)

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