2507/304
COMMUNICATION, SURVEILLANCE AND
NAVIGATION SYSTEMS
Oct. / Nov. 2017
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN AERONAUTICAL ENGINEERING (AVIONICS OPTION)

MODULE III

COMMUNICATION, SURVEILLANCE AND NAVIGATION SYSTEMS

3 hours

INSTRUCTIONS TO CANDIDATES

*This paper consists of **THREE** sections; **A**, **B** and **C**.*
*Answer **THREE** questions from section **A**; **ONE** question each from sections **B** and **C**, in the answer booklet provided.*
All questions carry equal marks.
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: NAVIGATION

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

1. (a) Outline **three** drawbacks of instrument system compared to microwave landing system. (3 marks)

(b) Explain the operation of a microwave landing under each of the following headings:

(i) approach azimuth;
(ii) approach elevation;
(iii) range;
(iv) data communication.

(12 marks)

(c) With aid of a sketch, show the coverage volume of the elevation station. (5 marks)

2. (a) Explain **three** basic requirements of an aircraft communication system receiver. (6 marks)

(b) Outline **six** types of information contained in a radio communication system cable coding. (6 marks)

(c) Highlight the procedure of inspecting the HF antenna installations for cracks and general conditions. (8 marks)

3. (a) Determine the:

(i) frequency of a radio wave length of 500 metres;
(ii) wavelength of a VHF broadcast of 60 mHz;
(iii) frequency of a radar installation working with a wavelength of 20 cm.

(6 marks)

(b) Explain the installation of a typical modern aircraft HF under the following headings:

(i) units;
(ii) interconnection;
(iii) interlock;
(iv) unit location.

(14 marks)

4. (a) Describe the cabin address PA facility of an audio integrating system provided in modern commercial aircraft. (8 marks)

(b) With the aid of a labelled block diagram, describe a typical inter-phone communication system. (12 marks)

SECTION B: AIRCRAFT COMMUNICATION

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

5. (a) Highlight the procedure of carrying out operational test of an underwater locator beacon. (14 marks)

(b) Describe the parts fitted on an aircraft Traffic Alert and Collision Avoidance System. (6 marks)

6. (a) Considering a stationary receiver tuned to a transmitter, explain the principle of doppler ground speed measurement. (6 marks)

(b) With respect to aircraft radar systems, define each of the following as applied to aerials:

(i) gain;
(ii) beam width;
(iii) side lobe.

(3 marks)

(c) With aid of pulse waveform diagram, describe each of the following as applied in radar systems:

(i) pulse;
(ii) pulse duration;
(iii) pulse spacing;
(iv) pulse repetition frequency.

(11 marks)

SECTION C: SURVEILLANCE

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

7. With aid of a labelled block diagram, explain the operation of a simple transponder used in aircraft surveillance system. (20 marks)

8. (a) Explain **three** reasons for reduced DME percentage reply from the aircraft and ground beacon. (6 marks)

(b) With the aid of labelled block diagram, show a typical DME interrogator. (14 marks)

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