2507/201
AIRCRAFT INSTRUMENTS AND
MEASUREMENT SYSTEMS
Oct./Nov. 2019
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN AERONAUTICAL ENGINEERING
(AVIONICS OPTION)

MODULE II

AIRCRAFT INSTRUMENTS AND MEASUREMENT 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. Answer FIVE questions.
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

1. With the aid of a labelled sketch, describe the construction and principle of operation for each of the following types of telescopes:

    (a)   Galilean;   (10 marks)

    (b)   Keplerian.   (10 marks)

2. (a)   With reference to gyroscopes, define each of the following terms:

        (i)   rigidity in space;

        (ii)   precession.   (4 marks)

    (b)   With the aid of a labelled sketch, discuss the principle of operation of the artificial horizon.   (16 marks)

3. (a)   Highlight **ten** instances that necessitate compass swing.   (5 marks)

    (b)   With reference to compasses, explain each of the following:

        (i)   deviation;   (3 marks)

        (ii)   compass swing.   (6 marks)

    (c)   With the aid of sketches, show how the information on **table 1** can be represented: (6 marks)

Table 1

	Compass Heading	Deviation	Magnetic Heading
Deviation West Compass Best	095	−5	090
Deviation East Compass Least	090	+5	095

4. (a)   Discuss the primary standard of units.   (7 marks)

    (b)   With reference to measurements, describe each of the following units:

        (i)   fundamental;   (4 marks)

        (ii)   derived.   (9 marks)

5.   Four arms of a wheatstone bridge are connected as follows:

          AB = 100 ohms
          BC = 10 ohms
          CD = 4 ohms
          DA = 50 ohms

      A galvanometer with internal resistance of 200 ohms is connected between BD, while a battery
      of 10 V d.c is connected between AC. Using circuit diagrams, determine the:

      (a)   current through the galvanometer;   (10 marks)

      (b)   value of the resistance to be put on the arm DA so that the bridge is balanced.
                                                                                                  (10 marks)

6.   With the aid of a labelled cross-sectional sketch, explain the construction and operation of a
      chemical oxygen generator used on aircraft system.   (20 marks)

7.   (a)   With reference to equipment design and development, describe each of the following:

             (i)   maintainability;
             (ii)   failure mode;
             (iii)   reliability.   (6 marks)

      (b)   With reference to airplane equipment reliability, discuss a failure condition.
                                                                                                  (8 marks)

      (c)   As engineer in charge, explain the general assessment and inspection considerations
             after installing a new radio equipment on an aircraft to ensure operational reliability.
                                                                                                  (6 marks)

8.   With the aid of labelled information floor diagrams, explain the operational features of
      ARINC 629 type of central maintenance airbone diagnostic tool and instrument test equipment.
                                                                                                  (20 marks)

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