

2507/201
AIRCRAFT INSTRUMENTS AND
MEASUREMENT SYSTEMS
March/April 2024
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.**

1. (a) Describe **three** common principal features of direct reading compasses. (12 marks)
- (b) With aid of a labelled sketch, describe the construction of the flux valve used in remote compasses. (8 marks)
2. With reference to oxygen storage cylinders, describe each of the following:
 - (a) Construction; (5 marks)
 - (b) Testing; (5 marks)
 - (c) Life limit specifications; (5 marks)
 - (d) Safety. (5 marks)
3. With reference to equipment reliability:
 - (a) Highlight the general assessment and inspection considerations after installing a new avionic equipment on an aircraft. (5 marks)
 - (b) Using a labelled block diagram, show a typical tree of failure causes. (7 marks)
 - (c) Discuss what can be considered as an aircraft failure condition. (8 marks)
4. Describe the constructional design, function and safety aspect for each of the following main assemblies of a telescopic sextant:
 - (a) Telescopic tube; (10 marks)
 - (b) Eye piece assembly; (6 marks)
 - (c) The bubble unit. (4 marks)
5. Two incandescent lamps with $80\ \Omega$ and $120\ \Omega$ resistances are connected in series with a $200\ \text{V}$ DC source. If the voltmeter is connected nearer to the lamp than the ammeter, determine the error in measurement of power in the $80\ \Omega$ lamp using the voltmeter with internal resistance of $100\ \text{k}\Omega$ and an ammeter with internal resistance of $0.1\ \text{m}\Omega$. (20 marks)

6. Describe each of the following errors associated with airspeed indicators.
- (a) Density (5 marks)
 - (b) Instrument (2 marks)
 - (c) Position (3 marks)
 - (d) Manoeuvres-induced (4 marks)
 - (e) Compressibility (6 marks)
7. (a) With reference to gyroscopes, explain each of the following:
- (i) Rigidity;
 - (ii) Precession. (4 marks)
- (b) With the aid of a labelled sketch, discuss the construction and principal of operation of the artificial horizon. (16 marks)
8. (a) With aid of a labelled block diagram, describe a typical aircraft maintenance monitoring system used in modern aircraft. (11 marks)
- (b) Outline the capabilities of an ideal central maintenance computer fitted on modern aircraft. (9 marks)

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