

2506/102

2507/102

AIRCRAFT ELECTRICAL TECHNOLOGY

Oct./Nov. 2019

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**DIPLOMA IN AERONAUTICAL ENGINEERING
(AIRFRAMES AND ENGINES OPTION)
(AVIONICS OPTION)**

MODULE I

AIRCRAFT ELECTRICAL TECHNOLOGY

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Drawing instruments;

A non-programmable scientific calculator.

This paper consists of EIGHT questions in TWO sections; A and B.

Answer THREE questions from section A and TWO questions from section B in the answer booklet provided.

All questions carry equal marks.

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

Candidates should answer the questions in English.

(Take $\mu_0 = 4\pi \times 10^{-7} \text{ H/m}$)

This paper consists of 6 printed pages.


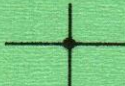
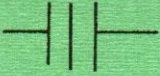
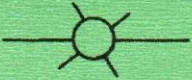
Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

SECTION A: AIRCRAFT ELECTRICAL INSTALLATION TECHNOLOGY

Answer THREE questions from this section.

1. (a) List **four** tools used in aircraft electrical installation work. (4 marks)
- (b) Describe each of the following aircraft power distribution systems:
- (i) split;
- (ii) parallel. (4 marks)
- (c) Table 1 shows various aircraft electrical wiring symbols. Complete the table. (4 marks)

Table 1

Symbol	Representation
	
	
	
	

- (d) With the aid of a labelled diagram, describe the working principle of a thermal type circuit breaker. (8 marks)
2. (a) Distinguish between joint and termination with respect to electrical wiring. (2 marks)
- (b) With the aid of diagrams, describe each of the following types of cable terminations:
- (i) pillar terminal;
- (ii) eyelet terminal. (8 marks)
- (c) List **four** safety gears used while carrying out wiring works in aircrafts. (4 marks)
- (d) (i) State **three** types of insulating materials used in aircraft wiring cables.
- (ii) Highlight **three** merits of copper conductors. (6 marks)

3. (a) (i) With the aid of a labelled diagram, describe the construction of a high rupturing capacity fuse (HRC).
(ii) Explain the operation of HRC fuses.
(iii) State **three** merits of HRC fuses. (10 marks)
- (b) With the aid of labelled diagrams, describe each of the following types of cables used in structured cabling wiring:
(i) unshielded twisted pair (UTP);
(ii) optical fiber cable. (10 marks)
4. (a) Table 2 shows aircraft navigation lights features. Complete the table. (6 marks)

Table 2

Colour	Location	Divergence	Wattage
White		140°	
	Left wing tip		20 W
Green		110°	

- (b) (i) State the inverse square law of illumination.
(ii) A lamp radiates luminous flux of 1200 lumens in all directions. The lamp is suspended 8 m above a working plane. Determine the:
I. luminous intensity;
II. illumination at a point on the plane 6 m away from the foot of the lamp. (7 marks)
- (c) A cabin crew room having a total effective area of 70 m², lit by a number of 40 W incandescent lamps each having 11 lm/W. An illumination of 80 lux is required on the room. Only 60% of the light emitted by the lamps is used for illumination. Determine the number of lamps required. (7 marks)
5. (a) List **four** items contained in a first aid kit. (4 marks)
(b) With the aid of an electrical wiring diagram, describe a ring circuit. (6 marks)
(c) Describe each of the following types of conduits systems, citing one area of application of each:
(i) PVC conduit;
(ii) flexible metal conduit. (6 marks)

- (d) Figure 1 shows a smoke detector alarm block schematic diagram. Explain its operation. (4 marks)

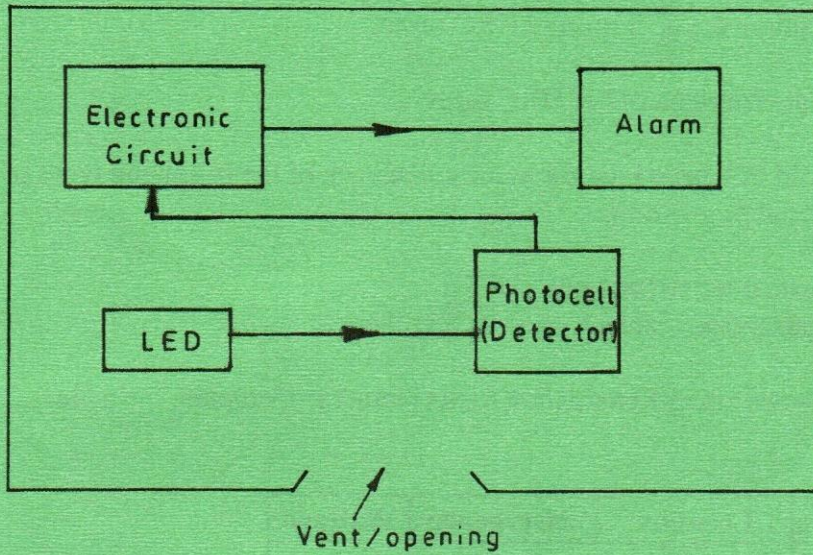


Fig. 1

SECTION B: ELECTRICAL ENGINEERING PRINCIPLES

Answer **TWO** questions from this section.

6. (a) Table 3 shows units of various electrical quantities. Complete the table. (4 marks)

Table 3

Unit	Quantity of measure
Coulomb	
Siemens	
Henry	
Farad	

- (b) An aircraft battery is used to start an engine. The starter draws a current of 1000 A for 30 seconds and the battery voltage remains 12 V for this period. Determine the:

- (i) power;
 (ii) energy.

(4 marks)

- (c) Figure 2 shows a lead-acid battery charging set up. With the aid of chemical equations, describe the process of charging the battery. (8 marks)

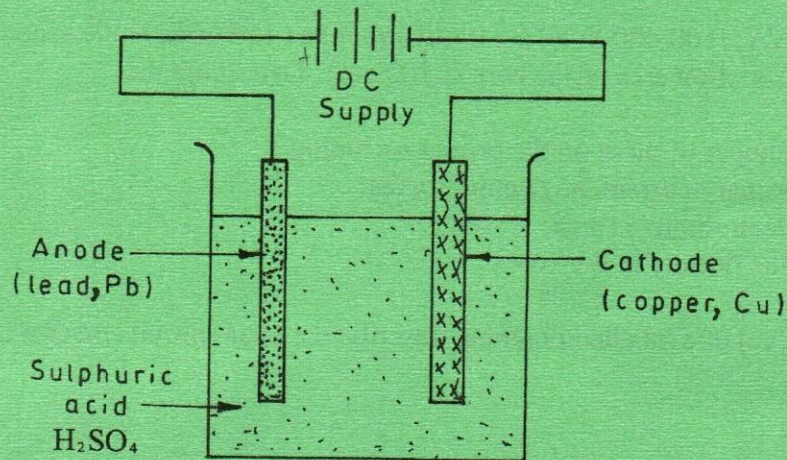


Fig. 2

- (d) A battery of six, 2 V cells is charged through a 1.2Ω resistor from a 20 V supply. The terminal voltage per cell is 1.8 V when discharged. Determine the current at the beginning of charging. (4 marks)
7. (a) Define the following with reference to a.c circuits, citing the units in each case:
- frequency;
 - period. (4 marks)
- (b) An alternating voltage is given by the expression $V = 75 \sin(200\pi t - 0.25)$ volts. Determine the:
- rms value;
 - frequency;
 - phase angle in degree. (8 marks)
- (c) A series circuit of resistance 60Ω and inductance 75 mH is connected to a 110 V, 60 Hz supply. Determine the:
- inductance reactance;
 - impedance;
 - current flowing in the circuit;
 - power dissipated in the circuit. (8 marks)

8. (a) With the aid of a labelled diagram, describe the construction of a shell type transformer. (6 marks)
- (b) A 750 KVA, 1100/400 V, 50 Hz transformer has 160 turns in the secondary winding. The cross section area of the core is 100 cm^2 . Determine the:
- (i) number of turns on the primary winding;
 - (ii) primary current, neglecting losses;
 - (iii) electromotive force;
 - (iv) flux density in the core. (8 marks)
- (c) With the aid of a labelled diagram, describe the open-circuit test of a transformer. (6 marks)

THIS IS THE LAST PRINTED PAGE.