



EAST AFRICAN SCHOOL OF AVIATION EXAMINATION

DIPLOMA IN AERONAUTICAL ENGINEERING AVIONICS

AIRCRAFT ELECTRICAL TECHNOLOGY

STREAM: MODULE 1 (Avionics + Airframes)

Duration: 3.00hrs

DATE: 11/04/2017/

TIME: 9:00 – 12:00 Hrs

INSTRUCTION TO CANDIDATES

1. *This paper consists of*
2. *You should have the following for this examination:*

Answer booklet;

Mathematical tables/ Electronic calculator.

3. Answer **THREE** questions in **SECTION A** any **TWO** questions in **SECTION B**

SECTION A: AIRCRAFT ELECTRICAL INSTALLATION TECHNOLOGY

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

1.
 - (a) List two types of secondary batteries commonly used in aircrafts and associated support equipment; differentiate the types named. **(4 marks)**
 - (b) State three functions of the aircraft battery **(3 marks)**
 - (c) Describe four electrical circuit protection devices used in electrical and electronic systems **(4 marks)**
 - (d) Briefly describe two functions of an aircraft generator control unit. **(2 marks)**
 - (e) Define the term **busbar**. **(2 marks)**
 - (f) Define the term **earthing** as used in electrical systems and state its advantages in circuits **(4 marks)**

2.
 - (a) Define the term battery. **(2 marks)**
 - (b) With the aid of sketches, differentiate between open and short circuits as applied in electrical wiring circuits. **(4 marks)**
 - (c) Differentiate between busbar and bus ties as the components used in an aircraft power distribution systems. **(6 marks)**
 - (d) With the aid of a block diagram, explain the functioning of a typical aircraft's power distribution system using single engine generator as the source of power. **(6 marks)**
 - (e) Differentiate between the following lighting technologies used in illumination.
 - (i) Incandescence and
 - (ii) Electro-luminescence **(2 marks)**

3.
 - (a) State any four factors considered when selecting the cable size of a given electrical power installation. **(8 marks)**
 - (b) With the aid of labeled diagrams, describe each of the following in electrical installation circuits:
 - (i) Radial
 - (ii) Ring **(6 marks)**
 - (c) Describe each of the following electrical diagrams
 - (i) Block diagrams
 - (ii) Pictorial diagrams
 - (iii) Schematic diagrams **(6 marks)**

4.
 - (a)
 - (i) Explain each of the following types of aviation hazards:
 - (I) Bird strike
 - (II) Ageing aircraft
 - (ii) State two action taken to prevent each of the hazards named above. **(12 marks)**
 - (b) Explain the functions of each of the following aircraft flight instruments:
 - (i) Altimeter
 - (ii) Vertical speed indicator **(4 marks)**
 - (c) Differentiate between screening and armouring as used in electrical cable citing the importance of each. **(4 marks)**

5. (a) State three steps taken when dealing with safety in relation to hazardous substances in an aircraft environment. **(3 marks)**
- (b) (i) Define a hazardous substance
(ii) State any two “hazardous substances” in an aircraft environment with their associated harm to people. **(5 marks)**
- (c) (i) Compare reducing aircraft noise at the source and wearing hearing protectors
(ii) State any four measures employed in an aircraft to reduce noise levels of loud machines and equipment. **(8 marks)**
- (d) List **two** risks associated with working in a designated aircraft confined space and two corresponding safety measures to be taken **(4 marks)**

SECTION B: ELECTRICAL ENGINEERING PRINCIPLES

Answer any **TWO** questions from this section.

6. (a) State the following laws:
(i) Ohm’s law
(ii) Kirchhoff’s voltage law
(iii) Superposition theorem **(6 marks)**
- (b) Capacitances of $3\mu\text{F}$, $6\mu\text{F}$ and $12\mu\text{F}$ are connected in series across a 350V supply. Calculate
(i) The equivalent circuit capacitance.
(ii) The charge on each capacitor
(iii) The pd across each capacitor **(9 marks)**
- (c) Explain polarization and local action in a dry cell and state how it is minimized. **(5 marks)**
7. (a) Define the following terms
(i) Effective value;
(ii) Period;
(iii) Amplitude. **(3 marks)**
- (b) The current in an ac circuit at any time t seconds is given by $I = 120\text{sine}(100\pi t + 0.36)$ amperes. Find;
(i) The peak value and phase angle;
(ii) The value of the current when $t = 0$
(iii) The value of the current when $t = 8$
(iv) The time when current first reaches 60A **(8 marks)**
- (c) A coil of 300 turns is wound uniformly on ring of non-magnetic material. The ring has a mean circumference of 40 cm and a uniform cross sectional area of 4cm^2 . If the current in the coil is 5A; calculate,
(i) The magnetic field strength,
(ii) The flux density
(iii) The total magnetic in the ring **(6 marks)**

- (b) With the aid of labeled diagram, explain the operation of a moving coil instrument **(3 marks)**
8. (a) State any three advantages of thermocouples. **(3 marks)**
- (b) An electric heater consumes 3.6MJ when consumed to a 250V supply for 40 minutes. Find the power rating of the heater and the current taken from the supply. **(5 marks)**
- (c) (i) Calculate the resistance of a 2 km length of aluminum overhead power cable if the cross-sectional area of the cable is 100 mm^2 . Take the resistivity of aluminum to be $0.3 \times 10^{-6} \Omega \text{m}$. **(5 marks)**
- (ii) Ten 1.5V cells each having an internal resistance of 0.2Ω are connected in series to a load of 58Ω . Determine
- (I) The current flowing in the circuit
- (II) The pd at the battery terminals
- (III) A coil of copper wire has a resistance of 100Ω when its temperature is 0°C . Determine its resistance at 70°C if the temperature coefficient of resistance of copper at 0°C is 0.0043Ω **(7 marks)**