



EAST AFRICAN SCHOOL OF AVIATION EXAMINATION

END - TERM I EXAM

SUBJECT: AIRCRAFT PROPULSION

EXAMINATION FOR THE AWARD OF DIPLOMA IN AERONAUTICAL
ENGINEERING

STREAM: Y3 (Airframes & Engines) Duration:

DURATION: 3 Hr

DATE: 18th March, 2016

TIME: 03:00-04:00 p.m.

Instructions

1. This paper consists of **THREE** printed pages.
2. Answer any **FIVE** questions in this paper.

1. With the aid of line diagrams, discuss the relationship between pressure, velocity/volume and temperature during the complete working cycle of an aircraft gas turbine engine
. (20 marks)

2. (a) Outline FIVE factors that make Nickel based alloy the best suited material for the manufacture of the aircraft engine turbine blades
. (5marks)

(b) Describe the construction of each of the following aircraft engine parts. (6marks)

(i) Nozzle guide vanes

(ii) Turbine blades

(iii) Shroud casing

(c) With the aid of a sketch, explain the energy transfer from hot expanding gas flow to the turbine with temperature control provision. (9marks)

3. With the aid of a pressure/volume diagram, explain the complete operating cycle of a four stroke aircraft piston engine.
(20marks)

4. (a) Outline the operational contrast between aeropiston engine and aerogas turbine engine.
(5 marks)

(b) With the aid of a sketch, explain the principle method of varying the fuel flow requirements for each of the following aircraft engines:
(15marks)

(a) Aeropiston

(b) Gas turbine

5 (a) State five factors that would affect aircraft engine operation during flight. (5marks)

(b) Explain each of the following aircraft engine “on condition” monitoring devices:
(6marks)

(i) Radiation pyrometer

(ii) Accelerometer

(iii) Sight glass

(c) With the aid of a cross-section sketch, explain the construction and operation of a high pressure engine filter with ‘on condition’ monitoring techniques.
(9marks)

6. (a) Outline the advantages of limiting the length of the propeller blades during design. **(5marks)**
- (b) With the aid of a sketch, describe the construction and operation of the following aircraft propellers pitch change mechanisms. **(15marks)**
- (i) Two speed
 - (ii) Reversible
 - (iii) Adjustable
7. (a) Describe each of the two methods of injecting fluids into aircraft engines to increase performance. **(4marks)**
- (b) With the aid of sketches, explain each of the following methods of Reheat Ignition Systems: **(9marks)**
- (i) spark
 - (ii) hot streak/shot
 - (iii) catalytic
- (c) Sketch and label the four major sections of an aircraft engine afterburner and state the purpose of each **(7marks)**
8. (a) Differentiate between the following types of aircraft engines: **(6marks)**
- (i) Horizontally opposed and radial
 - (ii) Aeropiston and turbo propellers
 - (iii) Spark ignition and compression ignition
- (b) Being an engineer in charge of line maintenance, outline the procedure of installing a nineteenth cylinder four stroke engine to an aircraft. **(14 marks)**