**EAST AFRICAN SCHOOL OF AVIATION EXAMINATION**

**ENGINEERING SECTION**

**END TERM EXAMINATION**

**EXAMINATION FOR THE AWARD OF DIPLOMA IN AERONAUTICAL ENGINEERING**

**SUBJECT: AIRCRAFT PROPULSION**

**STREAM: Y3 (Airframes & Engines)** **Duration: 3 Hr**

**DAY/DATE: Friday 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 treak/shot

(iii)catalytic

(c) Sketch and label the four major sections of an aircraft engine afterburner and state the pupose 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 an eighteen cylinder four stroke engine to an aircraft. (14 marks)