2506/201
AIRCRAFT PROPELLER SYSTEMS
Oct./Nov. 2023
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN AERONAUTICAL ENGINEERING

MODULE II

AIRCRAFT PROPELLER SYSTEM

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
Answer booklet;
Drawing instruments;
Mathematical tables/Non programmable scientific calculators.
*This paper consists of **EIGHT** questions.*
*Answer **FIVE** questions in* the *answer booklet provided.*
Maximum marks for each part of a question are as shown.
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.

Turn over

1. (a) With the aid of a labelled sketch, show the elements of an aircraft propeller blade. ($6\frac{1}{2}$ marks)

(b) (i) Explain **three** factors that affect thrust and drag in a propeller. ($4\frac{1}{2}$ marks)

(ii) Differentiate between torque and negative torque. (2 marks)

(c) Discuss aero propeller vibration forces and resonance . (7 marks)

2. (a) Explain the construction of each of the following types of propeller blades, stating **four** limitations for each:

(i) solid metal blades;

(ii) composite blades. (10 marks)

(b) Outline the functions of each of the following propeller components:

(i) hub; (3 marks)

(ii) spinner; (2 marks)

(c) Highlight **five** key requirements of the aircraft propeller inspection. (5 marks)

3. (a) Outline **five** requirements of the aircraft propeller auxiliary system. ($7\frac{1}{2}$ marks)

(b) With the aid of a labelled circuit diagram, show the aircraft propeller electrical de-icing system. (8 marks)

(c) Explain the **three** tests routinely carried out on the electrical de-ice systems. ($4\frac{1}{2}$ marks)

4. Discuss the propeller equipped engine ground running procedures under each of the following headings:

(a) aircraft safety precautions; (3 marks)

(b) personnel safety precautions; (6 marks)

(c) points to be observed prior ground running; (5 marks)

(d) engine limitations during power check. (6 marks)

5. (a) With the aid of a labelled sketch, explain how thrust is developed by a propeller blade. (12 marks)

(b) Explain the operation of the constant speed unit. (8 marks)

6. (a) With the aid of a labelled sketch, describe the operation of the hydraulic pitch lock valve. (9 marks)

(b) Explain each of the following aircraft propeller maintenance tasks:

(i) shock load check; (4 marks)
(ii) blending out. (7 marks)

7. (a) (i) Explain blade tracking as applied to aircraft propellers. (3 marks)

(ii) Describe **five** methods used in propeller blade tracking. ($12\frac{1}{2}$ marks)

(b) Outline the safety precautions to be observed during blade tracking. ($4\frac{1}{2}$ marks)

8. (a) Discuss each of the following aircraft propeller blade damage:

(i) impact; ($4\frac{1}{2}$ marks)

(ii) delamination. (5 marks)

(b) Explain **seven** functions of aircraft engine and propellers performance monitoring instruments. ($10\frac{1}{2}$ marks)

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