

2506/201

AIRCRAFT PROPELLER SYSTEMS

June/July 2018

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN AERONAUTICAL ENGINEERING
(AIRFRAMES AND ENGINES OPTION)

MODULE II

AIRCRAFT PROPELLER SYSTEMS

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Drawing instruments.

This paper consists of EIGHT questions.

Answer FIVE questions.

All questions carry equal marks.

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

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.

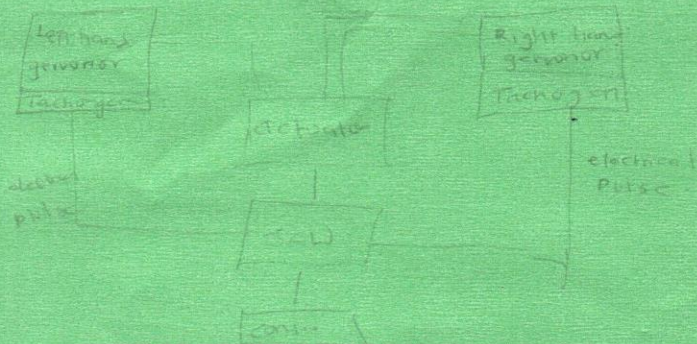
1. With the aid of labelled sketches, explain the forces that act on a propeller in flight. (20 marks)
2. (a) With the aid of a sketch, explain the blade element theory. (7 marks)
- (b) With the aid of labelled sketches, explain the relationship between propeller blade pitch angle and angle of attack for each of the following:
- (i) zero speed;
 - (ii) low speed;
 - (iii) high speed;
 - (iv) increased R.P.M.
- (8 marks)
- (c) With reference to propeller blade section, show the following:
- (i) blade angle;
 - (ii) axis of rotation;
 - (iii) plane of rotation;
 - (iv) blade face.
- (5 marks)
3. With the aid of sketches, describe the operation of each of the following constant pitch propellers:
- (a) non-counter weight; (10 marks)
 - (b) counter weight. (10 marks)
4. With the aid of labelled sketches, describe the construction and operation of a propeller governor. (20 marks)
5. With the aid of labelled sketches, explain the operation of a hydromatic feathering propeller. (20 marks)
6. (a) With the aid of sketches, explain the position and effect of each of the following propeller control levers:
- (i) power;
 - (ii) condition.
- (8 marks)
- (b) Highlight the maintenance procedure for each of the following with reference to propeller balancing:
- (i) static;
 - (ii) dynamic.
- (12 marks)

7. With reference to propeller maintenance, highlight:

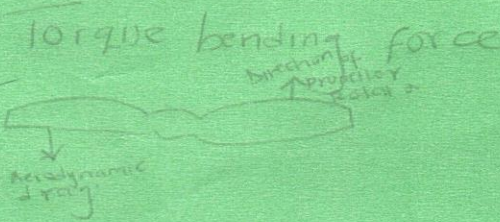
- (a) the major repairs; (10 marks)
- (b) six major allowable modifications; (6 marks)
- (c) four effects of repairs and modifications. (4 marks)

8. With the aid of a labelled schematic diagram for a twin-engine turboprop aircraft synchronization system, describe each of the following:

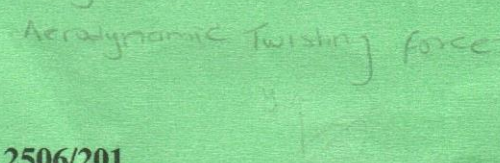
- (a) construction; (12 marks)
- (b) synchronization; (5 marks)
- (c) sychrophasing. (3 marks)



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torque bending force → The blade tends to move in opposite direction of rotation. It is caused by aerodynamic drag.



Aerodynamic Twisting force: the centre of pressure is in front of the plane of rotation and this results to the blade moving toward coarse pitch.

