higher education & training

Department:
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REPUBLIC OF SOUTH AFRICA

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NATIONAL CERTIFICATE

AIRCRAFT MAINTENANCE THEORY N2

(11041102)

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This question paper consists of 6 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
AIRCRAFT MAINTENANCE THEORY N2
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Sketches must be large, neat and fully labelled.
5. Keep questions and sub-sections of questions together.
6. Write neatly and legibly.

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QUESTION 1

Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–C) next to the question number (1.1–1.5) in the ANSWER BOOK.

1.1 Hardening, when applied to steel, is a process used to ...

A produce a hard surface and a tough core.
B produce maximum hardness and to make it more resistant to wear due to abrasion.
C Increase surface strength and improve corrosion resistance.

1.2 To carry out air frame rigging, it is necessary to place the aircraft in rigging position. *Rigging position* can be described as the position ...

A where all the weight of an object, an aircraft's in this case, is concentrated.
B where an aircraft's longitudinal and lateral axes are level.
C Both A and B are incorrect.

1.3 The purpose of a reservoir in a hydraulic system is, among others, to ...

A store hydraulic fluid under pressure.
B provide room for thermal expansion.
C limit the amount of pressure being exerted in the system.

1.4 Due to icing conditions causing problems to aircrafts flying at high altitudes, de-icing and anti-icing systems become essential for safe flight at those altitudes.

De-icing systems normally ...

A operate continuously during flight and prevents ice from forming.
B removes ice that has already formed.
C prevents the aircraft from reaching the altitudes where ice is likely to form during flight.

1.5 Ground-boosted engines are engines that ... without causing some damage to the engine.

A cannot be opened to full throttle at any altitude except on the ground
B can be opened to full throttle at sea level
C cannot be opened to full throttle at sea level

(5 × 1) **[5]**

QUESTION 2

2.1 2.1.1 Explain the term *angle of attack*. (1)

2.1.2 What effect does angle of attack have on the lift created on an aerofoil? (2)

2.2 Draw neat, labelled graphs of the lift and drag curves to show how the lift and drag changes at different angles of attack. (8)

2.3 When metal repairs must be carried out on aircraft structures, lines have to be scribed on the material to be used. It is often difficult to see these scribed lines on the metal, especially when intricate machining needs to be undertaken. To make scribed lines more visible, a marking-off medium is used.

Name TWO marking-off media. (2)

2.4 When an aircraft's air frame is designed, various stresses have to be taken into consideration as well as strain.

What is the difference between *stress* and *strain*? (4)

2.5 Make a neat, labelled drawing to illustrate *aspect ratio* and show the formula. (3)

2.6 Two types of air frame construction methods can be employed to build air frames – monocoque and semi-monocoque.

What advantages does the semi-monocoque construction have over the monocoque construction? (2)

[22]

QUESTION 3

3.1 In an aircraft hydraulic system, the engine-driven pump is the main source of pressure energy.

Explain the difference between a *constant-displacement pump* and a *variable displacement pump*. (4)

3.2 Make a neat, labelled drawing of a ball-type check valve (non-return) normally found in many hydraulic and pneumatic systems. (4)

3.3 An isolation valve is one of the essential components in an aircraft pneumatic system.

Why is the isolation valve so important? (2)

3.4 Make a neat, labelled drawing of a roots supercharger that may be found on some aircraft pressurisation systems. Also show the air flow through it. (6)

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3.5 What is the cause of ice formation on aircrafts and why is it so dangerous when it forms on the wings? (3)

3.6 When ice starts to build up on the aircraft during icing conditions, the windshields become opaque; thus, ice interferes with visibility.

Explain TWO ways in which this problem can be overcome. (6)
[25]

QUESTION 4

4.1 Make a neat drawing to illustrate a symmetry check that is done during airframe rigging checks. (3)

4.2 Describe THREE precautions when tensioning the cables during flight control system rigging. (3)

4.3 What is the purpose of the following:

4.3.1 Heat treatment of metals

4.3.2 Case hardening

(2 × 2) (4)

4.4 Explain what electro-plating is used for and how it is done. (5)

4.5 Name THREE factors that affect corrosion. (3)
[18]

QUESTION 5

5.1 Gas turbine engines require special fuel to operate efficiently.

State the general requirements for the fuel for these engines. (5)

5.2 The viscosity of any fluid is defined as the degree of resistance of the fluid to flow, in other words the higher the viscosity, the thicker the fluid.

How does the viscosity index relate to the viscosity of a fluid-like lubricating oil? (2)

5.3 When oils are chosen for aircraft engines, the oil usually is referred to as SAE 50.

What does this code refer to? (2)

5.4 State FIVE advantages that an injection-type carburettor has over a float-type carburettor. (5)

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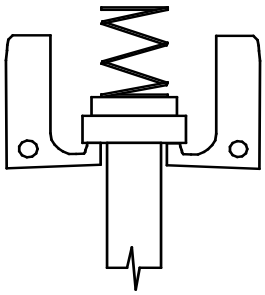
5.5 Explain the function of a supercharger as fitted to some aircraft piston engine powerplants. (3)

5.6 FIGURE 1 below shows a propeller governor in the 'on speed' condition.

Redraw the illustration in your ANSWER BOOK but show it in the 'over speed' condition. Label the different parts in the drawing.



Book On Speed
FIGURE 1

(3)
[20]

QUESTION 6

6.1 6.1.1 What does the abbreviation *IHP* on engines stand for?

6.1.2 What is its unit of measurement?

(2 x 1) (2)

6.2 Draw neat, labelled graphs to show the effects that pressure and temperature has on the trust of a gas turbine. (4)

6.3 Discuss the differences between the *gyroplane* and *helicopter* with regards to the rotor attitude during normal flight. (2)

6.4 A typical gas turbine engine consists of various sections, each performing a different function.

Name any TWO sections of a gas turbine engine. (2)
[10]

TOTAL: 100

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