higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

AIRCRAFT MAINTENANCE THEORY N2

(11041102)

25 November 2022 (X-paper)
09:00–12:00

Drawing instruments may be used.

This question paper consists of 7 pages.

229Q1E2225

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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. Start each question on a new page.
5. Use only a blue or black pen.
6. Write neatly and legibly.

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SECTION A

QUESTION 1

1.1 Various options are given as possible answers to the following questions. Choose the correct answer and write only the letter (A–C) next to the question number (1.1.1–1.1.5) in the ANSWER BOOK.

1.1.1 The angle formed between the chord line and a horizontal reference line when the aircraft is in the rigging position is called …

A the stalling angle.
B the angle of attack.
C the angle of incidence.

1.1.2 A compressor is used in an aircraft pneumatic system mainly to …

A convert mechanical energy into air-pressure energy by creating flow.
B trap tiny solid particles (10 mm or larger) to pass clean air into the system.
C convert air-pressure energy to mechanical energy by creating flow.

1.1.3 Which ONE of the following is not an advantage of pressurisation systems?

A Bad and turbulent weather can be over flown; flying in the smooth air above the storms.
B Aircraft can fly more economical at low altitudes.
C Normal temperature and humidity can be maintained inside the cabin for satisfactory passenger comfort, irrespective of ambient conditions.

1.1.4 … is the power developed in the combustion chamber without reference to friction losses within the engine.

A Brake power
B Friction power
C Indicated power

1.1.5 The normal gear-driven supercharger has a/an … placed between the carburettor and intake pipes.

A axial compressor
B reciprocating air compressor
C central air compressor

(5 × 1) (5)

1.2 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'True' or 'False' next to the question number (1.2.1–1.2.5) in the ANSWER BOOK.

1.2.1 The jet turbine engine operates much like a toy balloon.

1.2.2 The angle of attack changes during the flight, but the angle of incidence remains fixed.

1.2.3 The true monocoque construction has internal bracing and can be compared to the structure forming a cocoon or eggshell where all the load is carried by the shell.

1.2.4 The injection carburettor differs from the float-type carburettors in that it is not fitted with a float chamber nor does the choke or venturi depression acts directly on the jets.

1.2.5 The true helicopter has no propeller for producing forward thrust but relies solely on its rotor for lift and thrust.

(5 × 1) (5)

1.3 Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–F) next to the question number (1.3.1–1.3.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
1.3.1	Heats the steel to just below its critical point	A	reservoirs
1.3.2	Replenishes the system fluid when needed	B	tempering
1.3.3	Has the same appearance as surface corrosion	C	intercrystalline corrosion
1.3.4	The number of times the chord will divide into the span of the wing	D	chemical corrosion
1.3.5	The process by which air and fuel vapour are mixed in suitable proportion	E	aspect ratio
		F	carburation

(5 × 1) (5)

1.4 Choose a word or words from the following list to match each description below. Write only the answer next to the question number (1.4.1–1.4.5) in the ANSWER BOOK.

disc area; case hardening; accumulators; compression; angle of incidence; blade loading; angle of attack, torsion

1.4.1 Stores hydraulic fluid under pressure

1.4.2 The circular area swept by the rotor

1.4.3 The angle formed between the chord line and the relative airflow

1.4.4 Cools the metal in the furnace

1.4.5 The stress that tends to crush or press a material together

(5 × 1) (5)
[20]

TOTAL SECTION A: 20

SECTION B

QUESTION 2

2.1 Lift is the force responsible for actually lifting the aircraft from the ground as it gradually increases in magnitude.

List FIVE factors that affect the lift. (5)

2.2 Name THREE advantages of true monocoque construction over semi-monocoque construction. (3)

2.3 List TWO case-hardening heat-treatment processes that can be used for treating steel. (2)

2.4 After assembly of an aircraft, the structure must be checked for correct alignment. One of these checks is checking *engine alignment*.

Describe how this check can be carried out. (5)

2.5 With the aid of a sketch, illustrate the fineness of an aircraft main wing (aerofoil). (5)
[20]

QUESTION 3

3.1 Name FOUR operational requirements of an aircraft hydraulic system. (4)

3.2 State FIVE hydraulically operated aircraft systems. (5)

3.3 Briefly discuss the purpose of the following components used in a pneumatic system:

3.3.1 Air filter

3.3.2 Moisture separator

3.3.3 Selector valves

3.3.4 Actuators

(4 × 2) (8)

3.4 Explain the difference between *anti-icing* and *de-icing.* (3)
[20]

QUESTION 4

4.1 The two principal types of compressors currently being used in turbojet aircraft engines are centrifugal-flow and axial-flow compressors.

List THREE components of centrifugal-flow compressors. (3)

4.2 List FOUR advantages of axial-flow compressors. (4)

4.3 Name FIVE advantages of fuel-injection systems. (5)

4.4 Mention the supercharged engines that can be opened to full throttle at sea level. (1)

4.5 After an engine is installed on the airframe, it is necessary to complete a test of engine performance called a ground run.

State SEVEN precautions to be taken before completing a test of engine performance. (7)
[20]

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QUESTION 5

5.1	Briefly explain the operation principles of hydromatic propellers.	(10)
5.2	Name FOUR controls in the helicopter that the pilot must use during the flight.	(4)
5.3	State FOUR secondary effects of supercharging.	(4)
5.4	What is the function of the collective cockpit control as used in a conventional helicopter?	(2)
		[20]

TOTAL SECTION B: 80
GRAND TOTAL: 100

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