higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

AIRCRAFT MAINTENANCE THEORY N3

(11041113)

4 December 2023 (X-paper)
09:00–12:00

This question paper consists of 10 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
AIRCRAFT MAINTENANCE THEORY N3
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 section on a new page.
5. Use only a black or blue pen.
6. Write neatly and legibly.

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QUESTION 1

Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–C) next to the question number (1.1–1.10) in the ANSWER BOOK.

1.1 Inspections are necessary in the aircraft industry ...

A to issue an airworthiness certificate as laid down by the authorities and to ensure the safety of the passengers and crew.
B to declare the aircraft serviceable at all times and that enough fuel is carried for the duration of the flight.
C Both A and B is correct.

1.2 During the course of routine maintenance in order to reduce the occurrence of corrosion on an aircraft ...

A ensure adequate cleaning of the aircraft.
B apply the correct heat treatment.
C prevent dissimilar metals from coming into contact.

1.3 To place the aircraft in a rigging position the aircraft must be jacked up and the procedure to be followed includes ...

A using the correct type of jacks and alignment pads.
B obtaining the correct manual for the jacking procedure.
C collecting the correct spirit levels and symmetry templates.

1.4 The effects of overloading an aircraft is …

A an increased difficulty in raising the nose of the aircraft.
B an increased tendency to dive, especially with power off.
C a lower angle and rate of climb.

1.5 The correct arrangement of the pitot-static system, is ...

A a pitot vent and a static probe or two on the side of the fuselage.
B a combined pitot plug and static head.
C a combined pitot-static head.

1.6 Fuses or circuit breakers are installed in the electrical system to ...

A use a device in one electrical circuit that can activate a current or a voltage to produce a change in the electrical condition of another electrical circuit.
protect the equipment from any electrical circuit overload.
B reduce the current flow in an electrical circuit to prevent component
C meltdown.

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1.7 Aircraft wheel rims are of the …

A split wheel and removable flange types.
B drop-centre fixed-flange and simple fixed-flange types.
C removable inner flange and simple fixed-flange types.

1.8 Precautions to take when pressure testing a fuel system in the workshop is …

A ensuring that all the vents are clear before commencing with the test.
B de-energising the electric system and removing the aircraft battery.
C filling the tank with the specified amount of fuel.

1.9 During routine inspection the spark plugs are inspected for …

A the condition of the glazing of the central electrodes.
B stripping of the threads of the ceramic centres.
C damaged hexagons and cross stripping of the threads.

1.10 The Teleflex cable consists of …

A a quadrant, cable and pulleys.
B push-pull plunger control and/or rigid conduit.
C cable, control lever and turnbuckles.

(10 × 1) **[10]**

QUESTION 2

2.1 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (2.1.1–2.1.5) in the ANSWER BOOK

2.1.1 In the pitot-static system the vertical speed indicator relates the rate of change of static pressure to a rate of climb or descent.

2.1.2 Extensive repair is the replacement of an entire part when a complicated part has been extensively damaged.

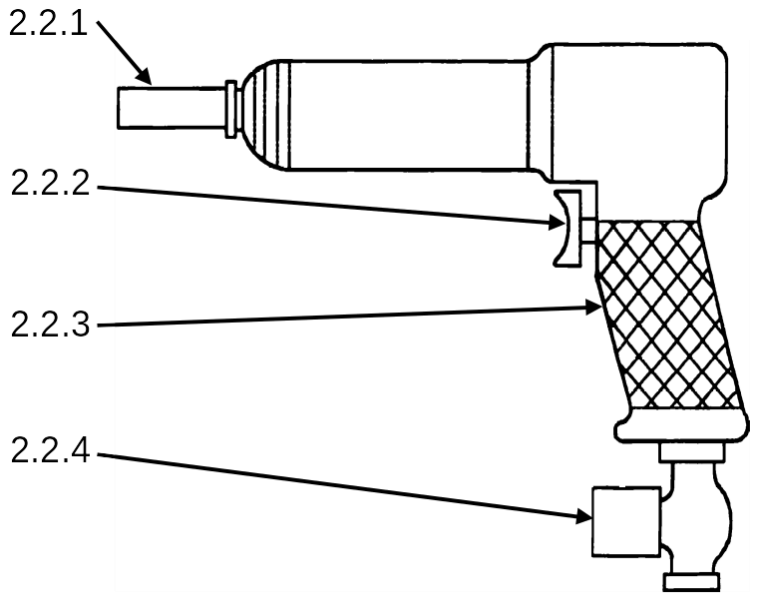
2.1.3 The secondary purpose of weight and balance control is to ensure the safety of the aircraft, passengers, and crew.

2.1.4 Piston engine inspection during overhaul involves stripping off and replacing all the outside components.

2.1.5 Two methods of pre-oiling can be employed on piston engines after an overhaul, namely pressure pre-oiling, and gravity (vacuum) pre-oiling.

(5 × 1) (5)

2.2 Choose a term from COLUMN B that matches a part of the pneumatic riveting gun illustrated in COLUMN A. Write only the letter (A–H) next to the question number (2.2.1–2.2.4) in the ANSWER BOOK.

COLUMN A	COLUMN B
 **Pneumatic riveting gun**	A regulator B set retainer C throttle D body E set F cylinder G grip H hammer

(4 × 1) (4)
[9]

QUESTION 3

3.1 A night landing with an aircraft ended up being a slightly hard landing.

Name any TWO things that must be checked on the morning after this suspected hard landing. (2)

3.2 Define the term, *stress corrosion.* (2)

3.3 Explain the procedure when using the ultrasonic crack detection test. (5)

3.4 Copy the following table for determining the empty weight and centre of gravity of an aircraft into your ANSWER BOOK and answer the following questions:

Weighing point	Scale reading	Tare	Corrected weight	Arm	Moments
Nose	5008	22	48862,8	4,4	214996,32
Left hand	6885	36	67120,2	47,9	**A**
Right hand	6889	36	**B**	47,9	3216935,26
		Empty weight	**C**	Total moments	**D**

3.4.1 Complete the table by filling in the blanks A–D. (4)

3.4.2 Calculate the centre of gravity of the aircraft of which the data is found in the table. (2)

[15]

QUESTION 4

4.1 An aircraft has undergone a minor inspection and structural rigging checks need to be carried out.

State THREE checks that need to be carried out during these checks. (3)

4.2 A pitot-static system is illustrated in FIGURE 1 including the instruments that are attached to it. Write down the names of the components (A–E) in the ANSWER BOOK. (5)

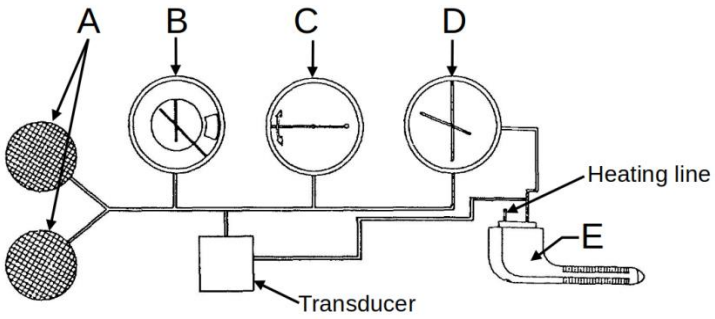


FIGURE 1

4.3 Illustrated below in FIGURE 2 is a terminal block used in electrical systems.

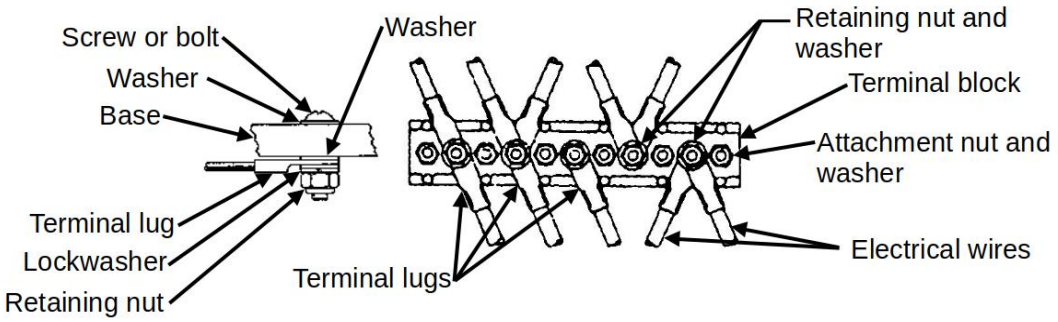


FIGURE 2

Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (4.3.1–4.3.4) in the ANSWER BOOK. During routine inspection the terminal block and its terminals must be inspected for:

4.3.1 General condition and cleanliness.

4.3.2 Loose, quick disconnections.

4.3.3 Broken or loose locking wire.

4.3.4 Security of attachment.

(4 × 1) (4)

4.4 An aircraft returning from a flight has the fault "tendency to yaw" reported in its logbook. Before its next flight, the fault has to be remedied. Answer the questions that follow:

4.4.1 In which manual will the fault and its corrective action be found? (1)

4.4.2 Discuss the FOUR possible faults for an aircraft to yaw to one side. (4)

4.5 A flying control system inspection has been completed and an operational check of the system has to be done. Explain this inspection. (4)

4.6 What is the purpose of the thermometer used during the rigging of the flying control system? (2)

[23]

QUESTION 5

5.1 An inspection on the inside of an aircraft fuel tank illustrated in FIGURE 3 is required during a major inspection of the aircraft. This is a very dangerous inspection that requires important precautions to be taken.

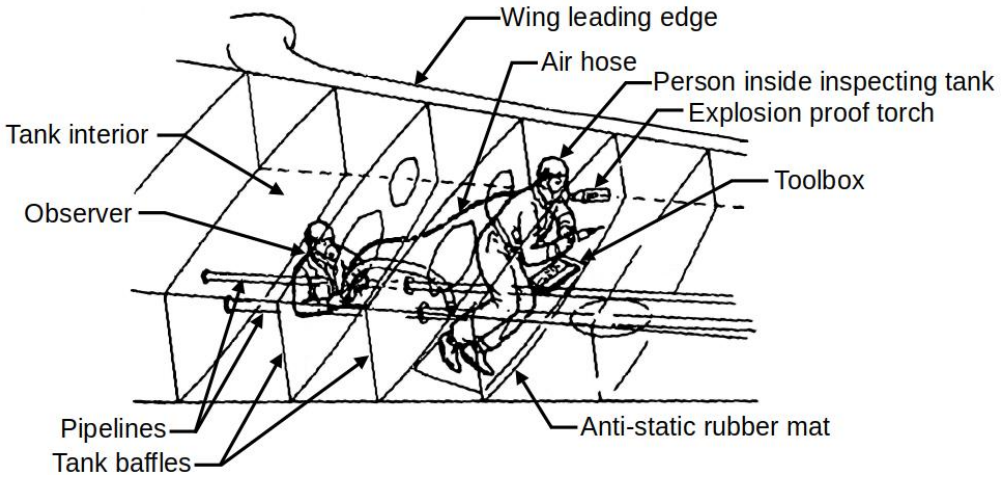


FIGURE 3

Discuss FIVE of these precautions to be taken when work on the inside of the fuel tank has to be conducted. (5)

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5.2 The main landing gear of a business jet is illustrated in FIGURE 4 below.

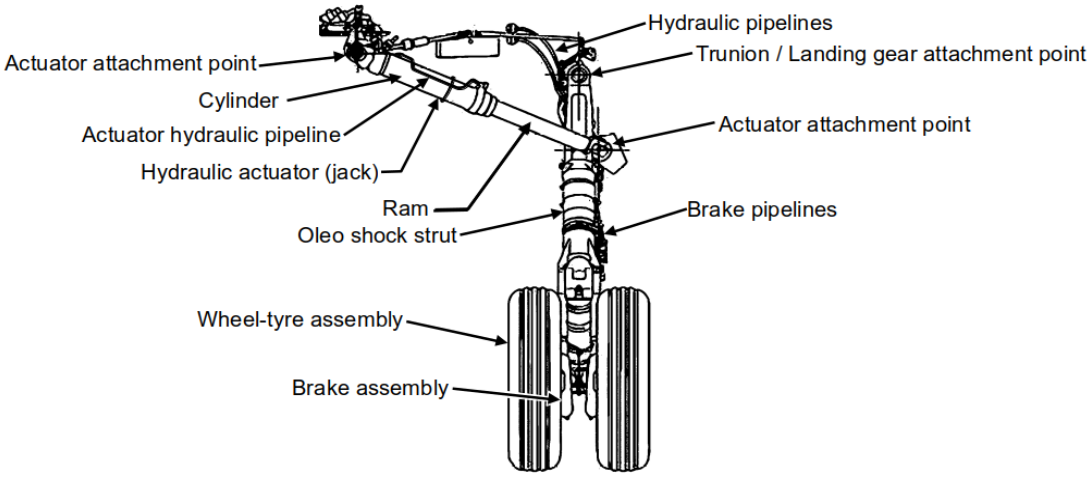


FIGURE 4

During a routine inspection the landing gear the actuator has to be inspected. Answer the questions that follow:

5.2.1 What is the purpose of the hydraulic actuator (jack) on the landing gear? (1)

5.2.2 If leaks are detected on the actuator when would the actuator require overhaul or replacement? (1)

5.2.3 How can the leakage be detected on the actuators? (1)

5.2.4 Would the operation of the actuators also be checked during an operational test of the hydraulic system? Give reasons for your answer. (3)

5.2.5 Give FOUR defects that an inspector would look for on the hydraulic actuator (jack) during this inspection. (4)

5.3 A routine inspection is conducted on a turboprop aircraft's fuel system, of which the fuel/oil heat exchanger unit is one, illustrated in FIGURE 5 below.

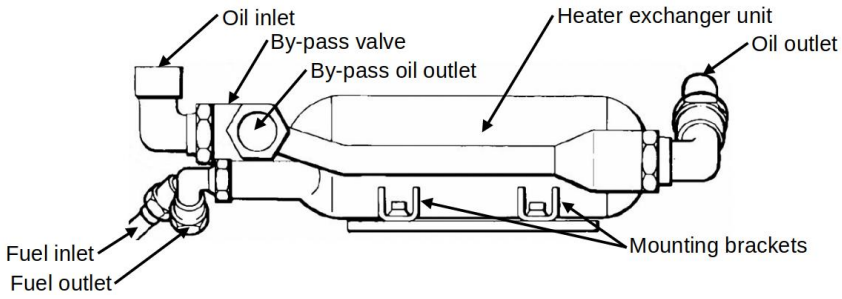


FIGURE 5

Name any FOUR defects that could be found on the fuel/oil heat exchanger unit during this inspection. (4)

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5.4 When inspecting a crankcase, name any FOUR defects that could be found. (4)

5.5 A gas turbine engine's turbines are subject to high stresses and heat. Turbine blades like the one illustrated in FIGURE 6 are normally at the receiving end of the heat and high rotational speeds leading to these conditions.

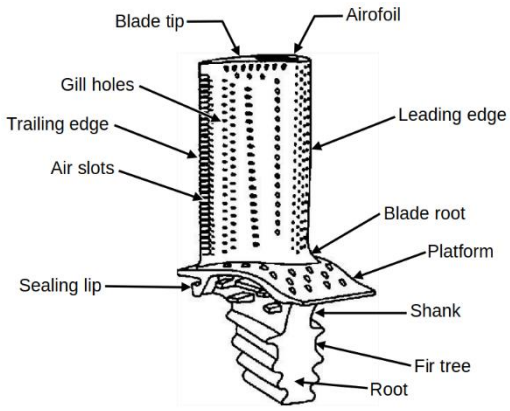


FIGURE 6

During engine overhaul the blades are removed and carefully inspected.

Name FOUR things that the blades would visually be inspected for during this overhaul. (4)
[27]

QUESTION 6

6.1 An aircraft piston engine's lubrication system has to be inspected during routine maintenance.

State THREE components of the lubrication system that have to be inspected. (3)

6.2 A gas turbine engine's ignition system illustrated in FIGURE 7 has to be inspected during routine maintenance.

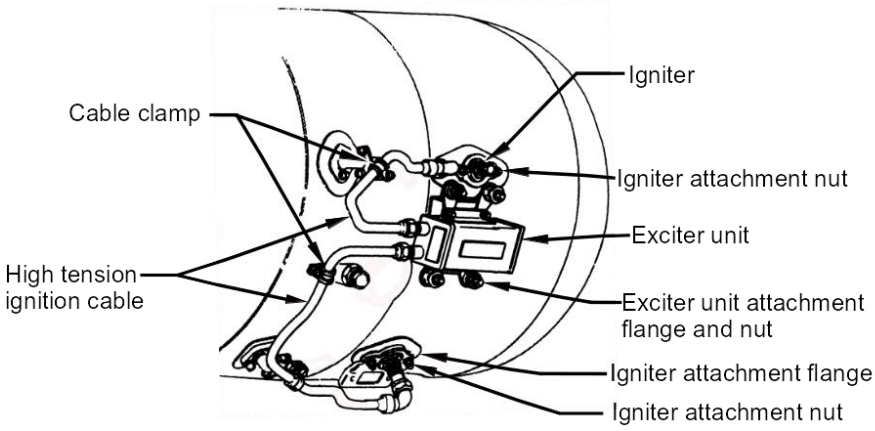


FIGURE 7

Name any THREE defects that the high-tension ignition leads would be inspected for. (3)

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6.3 FIGURE 8 contains an illustration of an aircraft's constant speed propeller.

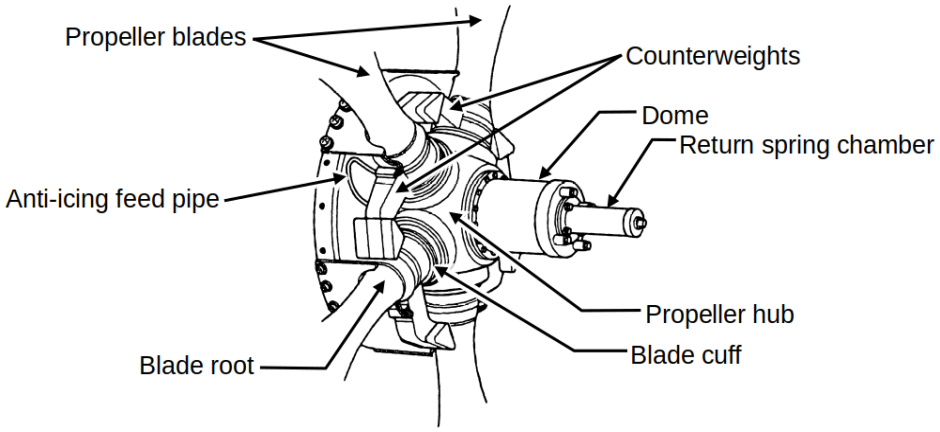


FIGURE 8

During routine inspection the propeller components are given a careful examination to determine its condition.

What would the counterweights be inspected for during this maintenance? Name any THREE inspections. (3)

6.4 A light aircraft's engine push-pull plunger control is illustrated in FIGURE 9.

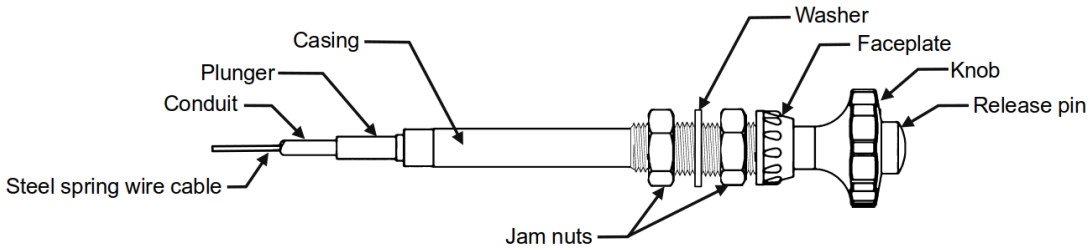


FIGURE 9

When a routine inspection is done on the engine control system what would the push-pull plunger control be inspected for? Name any THREE inspections. (3)

6.5 After an engine overhaul it must be tested in a test cell to run it in, to check for faults to determine its power output and to check the condition of the engine after overhaul.

State FOUR requirements that a test cell must consist of. (4)
[16]

TOTAL: 100

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