higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

AIRCRAFT MAINTENANCE THEORY N3

4 December 2023

This marking guideline consists of 7 pages.

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QUESTION 1

1.1	C		
1.2	A		
1.3	B		
1.4	C		
1.5	C		
1.6	C		
1.7	A		
1.8	A		
1.9	C		
1.10	B	(10 × 1)	[10]

QUESTION 2

2.1	2.1.1	True		
	2.1.2	True		
	2.1.3	False		
	2.1.4	False		
	2.1.5	True	(5 × 1)	(5)
2.2	2.2.1	E		
	2.2.2	C		
	2.2.3	G		
	2.2.4	A	(4 × 1)	(4)
				[9]

QUESTION 3

3.1
- Surface wrinkling
- Liquid leakage along riveted seams (especially fuel)
- Difficulty to operate flying or engine controls
- Burst, damaged or excessively worn tyres
- Bow or leakage of oleo legs
- External evidence of damage on spar webs, bulkheads, nacelle skin and attachments, firewall skin, and wing and fuselage stringers (Any 2 × 1) (2)

3.2 Stress corrosion occurs as the result of the combined effect of sustained tensile stresses and a corrosive environment. (2)

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3.3
- Clean the component of all paint, grease dirt and corrosion.
- Smear the component lightly with a thin layer of oil – it is essential to prevent an air gap between the component and the tip of the probe.
- Switch the apparatus on.
- Press the probe on the oily surface.
- Move the probe around on the component under test.
- As the probe is moved the crystal is electrically oscillated producing ultrasonic waves in the surrounding medium that can penetrate solids but cannot pass through an air gap or vacuum.
- The ultrasonic waves penetrate the depth of the component or material and are reflected back from the opposite surface of the component or defect in its path.
- A trace on the oscilloscope indicates whether a defect is present.

(Any 5 × 1 in the correct order) (5)

3.4 3.4.1

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	**3215057,58**✓
Right hand	6889	36	**67159,4**✓	47,9	3216935,26
			183142,4✓		**6646989,16**✓

(4)

3.4.2
$$CG = \frac{Total\ moments}{Total\ corrected\ weight}$$
$$= \frac{6646989,16}{183142,4} \quad ✓$$
$$\therefore \underrightarrow{CG = 36,294}$$

CG = 36,294 m✓ (2)

[15]

QUESTION 4

4.1
- Wing and horizontal stabiliser incidence check
- Wing and horizontal stabiliser dihedral check
- Fin verticality check
- Engine alignment check
- Symmetry check

(Any 3 × 1) (3)

4.2
A Static vents
B Altimeter
C Vertical speed indicator
D Airspeed indicator
E Pitot head (5)

4.3
4.3.1 True
4.3.2 False
4.3.3 False
4.3.4 True

(4 × 1) (4)

4.4 4.4.1 The maintenance manual of that particular aircraft. (1)

4.4.2
- The fin/vertical stabiliser is out of alignment.
- The fuselage is distorted.
- There is an external load that is unequal, causing greater drag on one side of the aircraft than the other.
- The rudder is out of alignment when the rudder pedals are in the neutral position.
- Incorrect adjustment of rudder's trim tab.
- An engine mounting that is out of alignment causes the engine thrust line to pull to left or right. (Any 4 × 1) (4)

4.5
- Check for correct cable routing.
- Carry out a directional check to check that the control surface movement corresponds to the cockpit control movement (synchronisation).
- Check the system for the correct static friction.
- Check the system for lost motion.
- Check the travel of the control surfaces for the correct amount of deflection.
- Check that the anti-balance tab or balance tab moves correctly in relation to control movement. (Any 4 × 1) (4)

4.6 It is used to ensure that temperature changes can be taken into account before making tension adjustments to cables in conjunction with the cable tension (rigging) chart.✓ (2)
[23]

QUESTION 5

5.1 When it is necessary to enter the tank observe the following precautions:
- Place a fire extinguisher nearby.
- No smoking or spark producing equipment should be permitted within 30 metres from the aircraft.
- An anti-static sponge rubber mat for the floor of the tank should be in place.
- Rubber soled shoes or canvas overshoes should be worn.
- Protective covers for bare arms, top and back of the head should be worn.
- Explosion proof lamps or torches should be used.
- A remote breathing apparatus should be used.
- A lifeline should be used.
- A competent person should act as observer outside, operate the remote breathing apparatus, and be able to communicate with the person entering by means of the lifeline. (Any 5 × 1) (5)

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5.2 5.2.1 To raise and lower the landing gear. (1)

5.2.2 When the leakage exceeds 60 drops per minute under pressure. (1)

5.2.3 Leakage can be detected on the actuator by looking for discolouration where leakage is taking place or if no leaks are visible, by pressurising the actuators by means of operating the hydraulic system. (1)

5.2.4 Yes, it would be checked.
To check if the actuators function correctly and to check for leakage while they are under pressure.✓✓ (3)

5.2.5 Inspect the hydraulic actuators for:
- bow in the chrome part of the ram
- excessive play in the mounting points
- leakage of actuator and pipeline attachments
- secure attachment to the structure and landing gear leg
- secure attachment of hydraulic pipelines
- damage on the chrome part of the ram
- corrosion
- cracks
- wear (Any 4 × 1) (4)

5.3 Inspect the fuel/oil heat exchanger for:
- leakage
- dents
- corrosion
- cracks on heat exchanger unit and attachment brackets
- loose or missing mounting bolt/nuts
- loose pipeline connections
- incorrect routing of pipelines attached to heat exchanger unit
- broken attachment brackets (Any 4 × 1) (4)

5.4 Inspect crankcase for:
- cracks
- fretting
- wear
- corrosion
- elongation of bolt and stud holes
- burring
- fretting of mating surfaces (Any 4 × 1) (4)

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5.5 Inspect the blades for:
- stress rupture cracks
- deformation of leading edges
- corrosion including pitting
- impingement of foreign materials
- dents
- waviness
- nicks
- overheating
- stretch/creep
- blade tip curling
- bending
- scratches
- burrs
- galling
- gouging
- scoring (Any 4 × 1) (4)

[27]

QUESTION 6

6.1
- Oil tank
- Oil pump
- Oil cooler
- Oil filter
- Pressure relief valve (Any 3 × 1) (3)

6.2 Inspect ignition leads for:
- wear
- burnt areas
- deep cuts
- fraying
- general deterioration
- worn or broken insulation
- overheating
- adequate support throughout its length
- correct routing
- twisting
- excessive bending
- loose/broke clamps
- chafing
- fluid contamination (Any 3 × 1) (3)

6.3 Inspect the counterweights for:
- dents
- scratches
- nicks
- distortion
- cracks
- corrosion (Any 3 × 1) (3)

6.4 Inspect the push-pull plunger control for:
- wear
- security of attachment
- lubrication
- freedom of movement
- excessive play
- lost motion
- bending
- corrosion
- binding (Any 3 × 1) (3)

6.5 A test cell requires:
- a mounting for the engine
- a coupling shaft for interconnecting the engine to the test device
- a fan and the necessary ducting for cooling the engine
- a starting system for the engine
- the necessary controls for operating the engine
- the necessary instruments to measure engine performance
- systems for supplying the engine with fuel and oil (and, if used, the dynamometer with water.)
- a depression box should be provided for the air intake so that altitude conditions can be simulated
- a flame-proof chamber for the operator (Any 4 × 1) (4)

[16]

TOTAL: 100

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