higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

AIRCRAFT MAINTENANCE THEORY N2

7 AUGUST 2019

This marking guideline consists of 7 pages.

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QUESTION 1

1.1 B
1.2 C
1.3 B
1.4 B
1.5 C

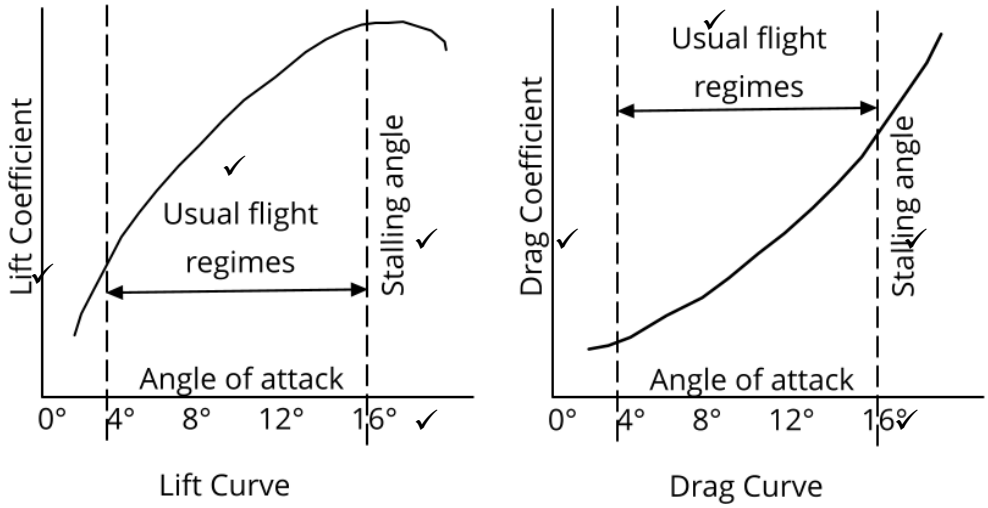
(5 × 1) **[5]**

QUESTION 2

2.1 2.1.1 *Angle of attack* is the angle formed between the chord line and the relative airflow. (1)

2.1.2 When the angle of attack is increased from 0°, the lift will increase✓ up to a certain point (stalling point ±15°), when the lift will start to decrease rapidly.✓ (2)

2.2



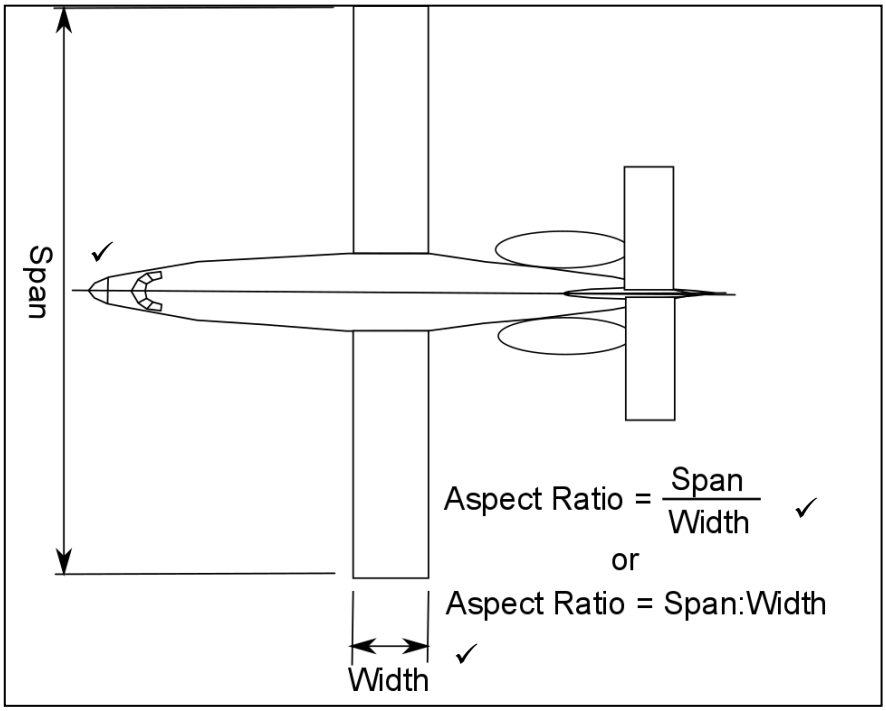
(8)

2.3
- Marking blue
- Gentian violet mixture
- Copper sulphate
- Powdered chalk mixed with water to form a creamy liquid called whitewash

(Any 2 × 1) (2)

2.4 *Strain* is deformation or physical change in a material✓ caused by stress✓ whereas *stress* is the force or load✓ a material or structure has to bear✓ (a force acting within an object that tries to prevent an outside force from changing its shape). (4)

2.5



(3)

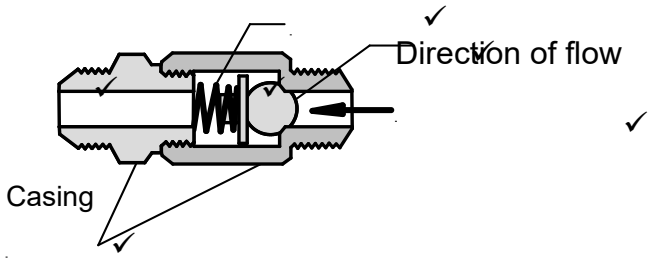
2.6
- Fairly light in weight
- Easy to repair damage on the structure
- Well-streamlined
- Can support enormous loads
- Light and thin skin metal can be used
- Very strong as long as its original shape is maintained (Any 2 × 1) (2)

[22]

QUESTION 3

3.1
- A *constant-displacement pump* is a fluid pump that moves a specific volume of fluid each time it rotates.✓ The faster the pump turns, the more fluid it moves. As a result, some form of pressure regulator or relief valve must be used with this type of pump when it is driven by an aircraft engine.✓
- The output of a *variable displacement pump* is controlled by the demands of the system✓ because these pumps normally have a built-in system pressure regulator.✓ (4)

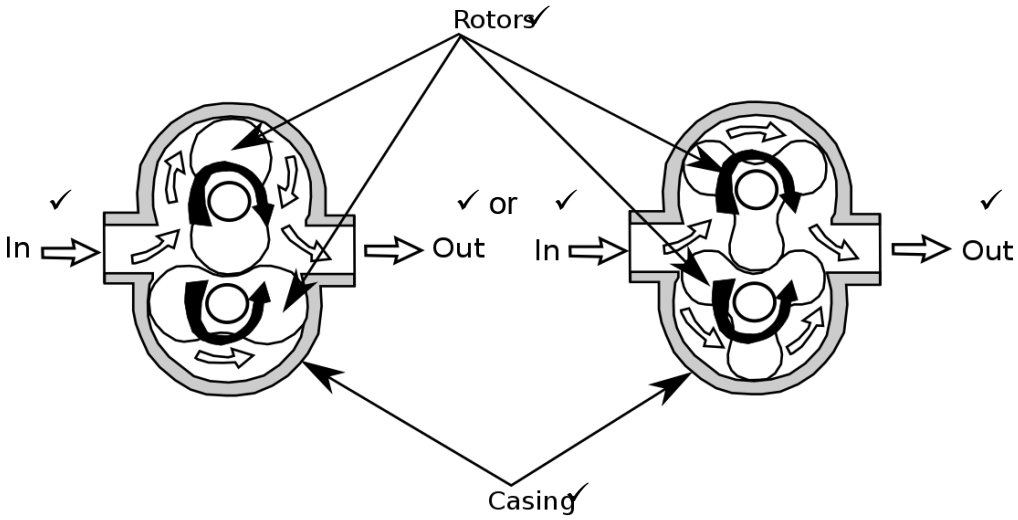
3.2



Non return/Check valve (2 × drawing, 2 × labels) (4)

3.3
- To ensure that the most essential services are available when the storage pressure falls below a predetermined minimum
- To ensure that that sufficient air is conserved for operating the most important services such as the landing gear and brakes. (2)

3.4



Roots Cabin Supercharger

(Candidate may draw either the 2-lobe or 3-lobe version of the supercharger or both of them.) (6)

3.5
- Ice may be expected to form whenever there is visible moisture in the air and the temperature is near or below freezing point.
- The moisture that strikes the surfaces of the aircraft freezes at these temperatures and sticks to the structure.
- This is critical on the wings because ice formation on the wings will interfere with smooth airflow over the wings and as a result reduces lift. (3)

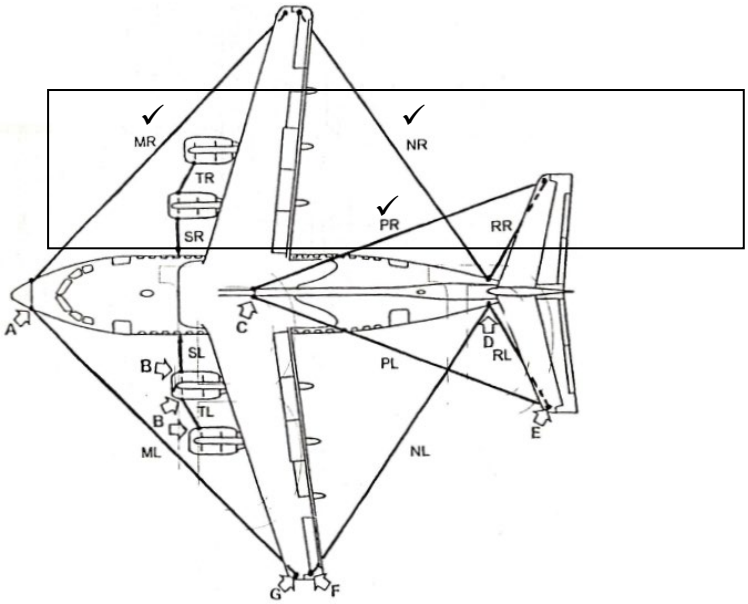
3.6 **Method 1** – Using heated air✓
Windshields are heated by pumping heated air through ducting and then between two windshield panels that has a gap in-between.✓
As the hot air flows between the windshield panels, the outer panel heats and ice will be prevented from forming on the hot outside panel.✓

Method 2 – Electrical panels✓
The system use an electrical heating element built into the window. When this method is used with pressurised aircraft, a layer of tempered glass gives strength to withstand pressurisation.✓
A layer of transparent conductive material (stannic oxide) is the heating element and a layer of transparent vinyl plastic adds a non-shattering quality to the window.✓ (6)

[25]

QUESTION 4

4.1



Symmetry check

(Candidate may draw more than 3 lines but any 3 of the lines are acceptable as long as it is correctly attached.) (3)

4.2
- Do not place the tensiometer on the cables when adjustments are being made.
- When taking readings, support the tensiometer by hand.
- Place the tensiometer well-away from fairleads and pulleys.
- Make adjustments equally on all turnbuckles.
- Move the cockpit controls before taking readings to ensure even distribution of tension. (Any 3 × 1) (3)

4.3 4.3.1 Heat treating is used to alter the physical and mechanical, and sometimes chemical, properties✓ of a material,✓ without letting it change its heat treatment shape.

4.3.2 To produce a 'soft' ductile core✓ with a very hard, wear resistant outer part that is subject to high wear✓

(2 × 2) (4)

4.4 Electro-plating is an anti-corrosion treatment✓ used to protect metals with a low resistance against corrosion.✓
The surfaces of the work are covered with a thin layer✓ of special metal (copper, nickel, chromium, lead, cadmium, tin, zinc, precious metals, etc.) by exposure of the metal in a solution of a metallic salt✓ which is decomposed by electrolysis.✓ (5)

4.5
- Climate – seawater, moisture-laden air, high temperatures
- Size of metal (thickness)
- Type of metal – certain metals, such as aluminium, have a higher resistance to corrosion than most steels have
- Foreign material in contact with the metal (Any 3 × 1) (3)

[18]

QUESTION 5

5.1
- Allow ease of flow under all operating conditions
- Allow quick starting of the engine
- Have a high calorific value
- Provide complete combustion under all conditions
- Be non-corrosive
- By-products of combustion should have no harmful effect on the flame tubes and turbine section
- Be a minimum fire hazard
- Be available in large quantities
- It must be inexpensive
- It must be readily available (Any 5 × 1) (5)

5.2 The viscosity index is a measure of the rate of change of viscosity✓ with change of temperature for a given fluid like lubricating oil.✓ (2)

5.3 The SAE 50 refers to the grade of the particular oil to be used, ranging from SAE 10 – 70.✓ It is related to the oil's viscosity.✓ (American Society of Auto Engineers) (2)

5.4
- Ice does not form from vaporisation of fuel in the throttle body of the carburettor.
- Since the system is entirely closed, it operates normal during all types of flight manoeuvres. Gravity and inertia have very little effect and is therefore almost unaffected by aerobatics and "negative g" conditions.
- The fuel is accurately and automatically metered at all engine speeds and loads regardless of changes in altitude, propeller pitch, or throttle position.
- Atomising of fuel under pressure results in smoothness, flexibility, and economy of power plant operation.
- The settings are simple and uniform.
- Protection is provided against fuel boiling and vapour locking. (Any 5 × 1) (5)

5.5 The primary function of the supercharger is to increase the density of the induction mixture✓ by maintaining an induction pressure✓ up to a predetermined height known as the rated altitude.✓ (3)

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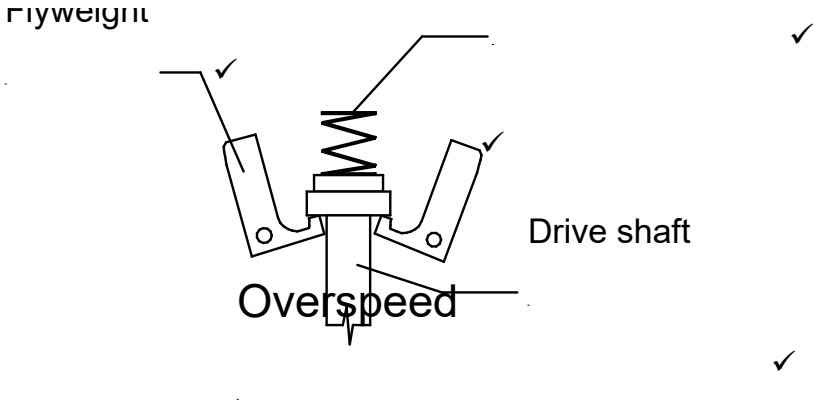
5.6



(1 × drawing, 2 × labels) (3)
[20]

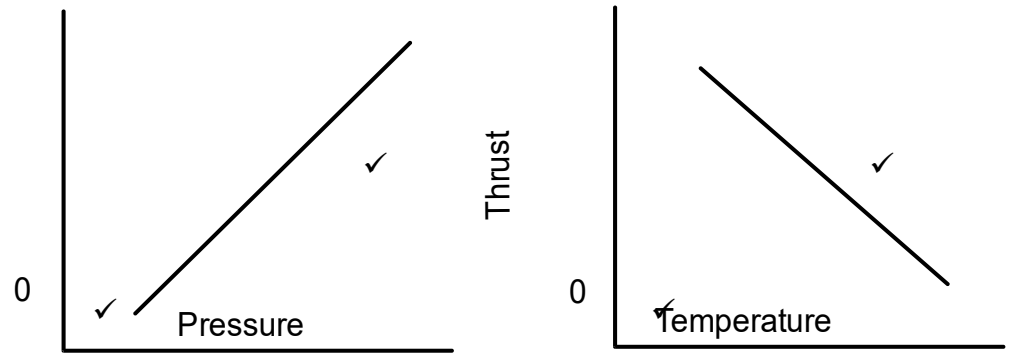
QUESTION 6

6.1 6.1.1 Indicated Horse Power

6.1.2 Watt or Kilowatt

(2 x 1) (2)

6.2



Factors affecting thrust
(1 mark for each graph line and
1 mark for each correct label) (4)

6.3
- The rotor of the gyroplane is tilted backwards.
- The rotor of the helicopter tilted forwards. (2 x 1) (2)

6.4
- Air inlet section
- Compressor section
- Combustion section
- Turbine section
- Exhaust section
- Accessory section (Any 2 × 1) (2)

[10]

TOTAL: 100

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