higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

AIRCRAFT MAINTENANCE THEORY N2

19 April 2021

This marking guideline consists of 8 pages.

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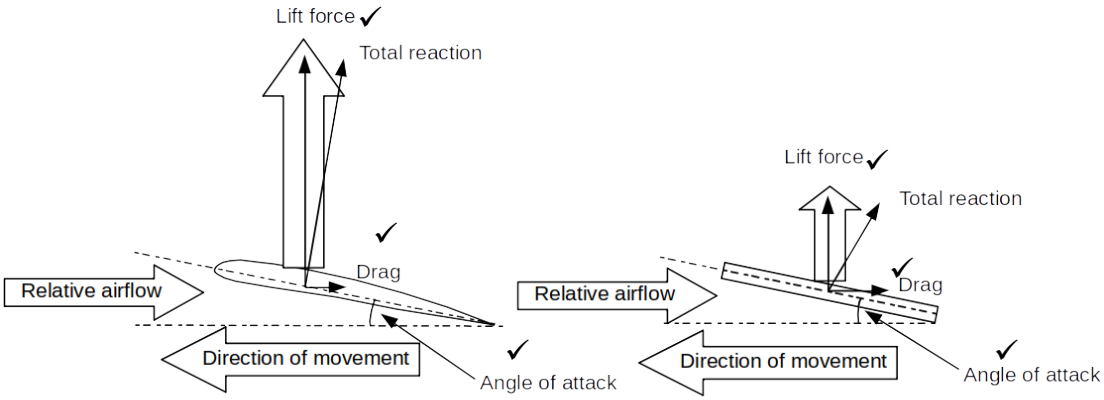
QUESTION 1

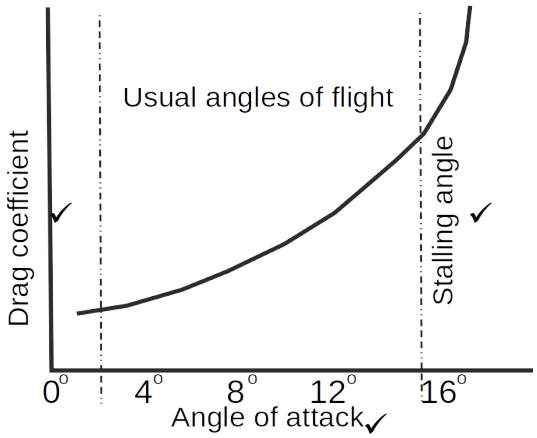
1.1



LIFT ON AEROFOIL **LIFT ON FLAT PLATE**

(6)

1.2

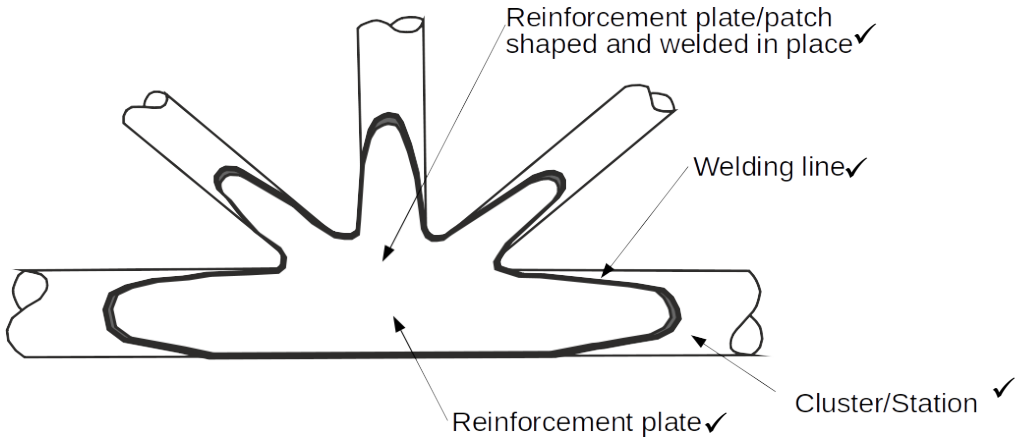


DRAG CURVE

(3)

1.3 Shear stress causes a sliding action✓ on an assembled structure – one layer of material slides along adjacent layer✓ causing rivets, bolts and screws to be sliced off in assembled structure.✓ (3)

1.4



PATCH PLATE REPAIR

(4)

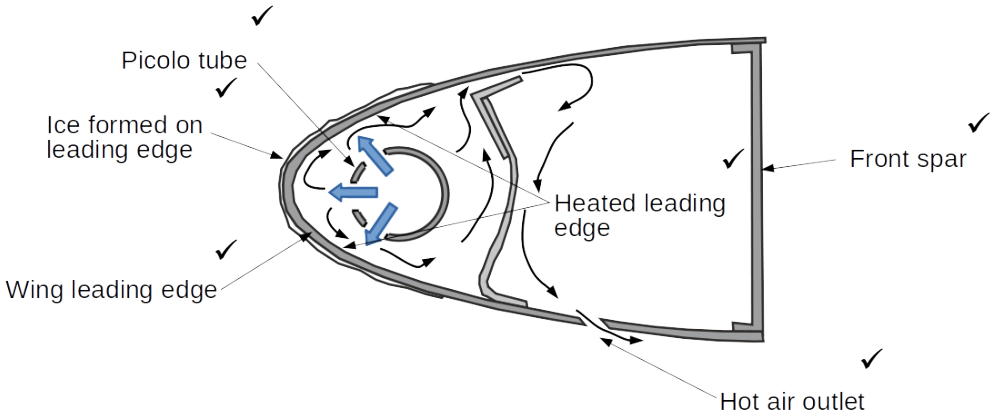
1.5
- To store supply of hydraulic fluid
- To replenish system fluid when needed
- To provide room thermal expansion of fluid
- To provide means for bleeding air from system (4)

[20]

QUESTION 2

2.1
- Reciprocating compressors
- Vane type compressors
- Roots blowers (Any 2 × 1) (2)

2.2



THERMAL WING DE-ICING WITH PICCOLO TUBE

(Drawing of tube in leading edge and double skin allowing hot air flow accepted) (6)

2.3 Fitted to control pressure in system. Diverts air from compressor✓ to atmosphere when air bottles are fully charged.✓ (2)

2.4 Checking whether wing is twisted. (1)

2.5
- Cable tension too high
- Foreign objects caught in system causing jamming
- Misalignment of pulley bracket, fairlead, control surface hinge, bell crank
- Seized or faulty bearings
- Excessive load on bearings
- Excessive corrosion of hinges
- Broken locking wire jamming pulley
- Damaged control surface hinge (Any 4 × 1) (4)

2.6
- Softening steel by reducing hardness or brittleness, thereby increasing ductility.
- Refining crystalline structure and removing internal stresses which may have been setup by previous heat treatment. (2)

2.7
- Steel heated to 30 °C above critical point
- Cooled slowly in furnace or asbestos packing (2)

2.8 Combined effect of sustained tensile stresses✓ and corrosive environment resulting in cracks forming in most metal systems.✓ Particularly characteristic of aluminium, copper, certain stainless steels, and certain high-strength alloys. (2)
[21]

QUESTION 3

3.1 Cannot be treated✓ resulting in structure being scrapped and replaced✓ (2)

3.2 Ignition of fuel/air mixture by hot spots or surfaces✓ in combustion chamber is called surface ignition.✓ If this occurs before the normal ignition event, ✓ the phenomenon is referred to as pre-ignition.✓ (2 × 2) (4)

3.3 Degree of resistance✓ of an oil to flow✓ (2)

3.4
- Amount of fuel passing through jet is dependent on pressure inside carburettor and therefore almost unaffected by aerobatics and 'negative g-' conditions.
- Spray nozzle helps to atomise fuel.
- Fuel under pressure reduces liability of vapour locks.
- No vaporisation and consequent cold spot around jet mouths; helping to prevent ice formation.
- Aircraft can fly inverted, or through series of 'high g-turns', climbs and dives, all at wide range of speeds and altitudes, and in short time. (Any 4 × 1) (4)

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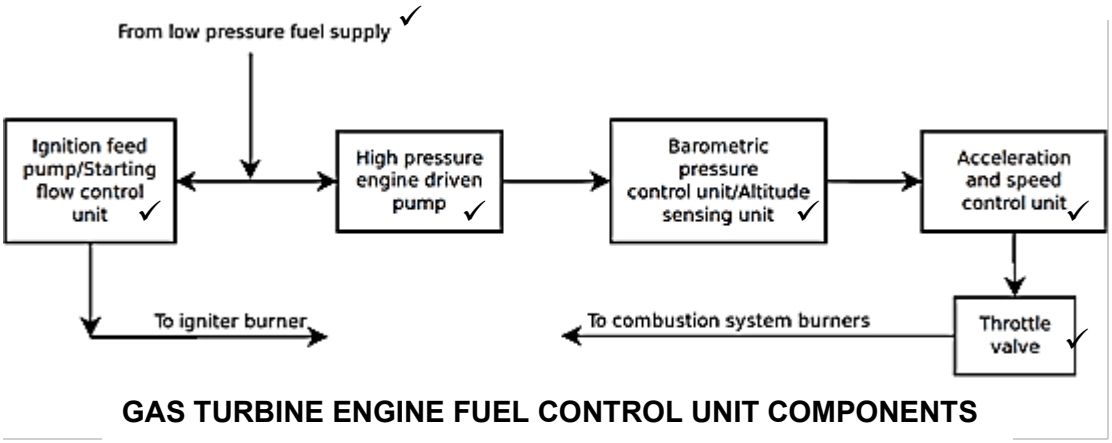
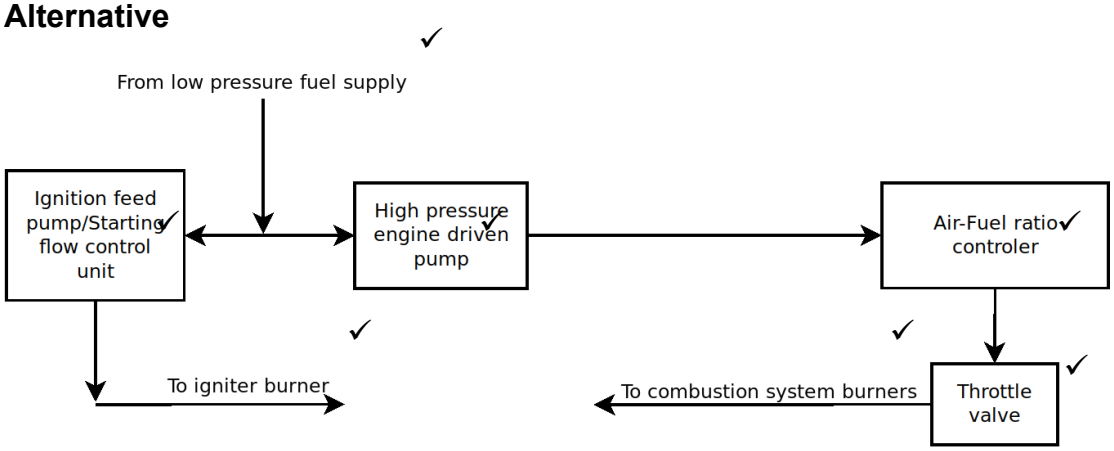
3.5



GAS TURBINE ENGINE FUEL CONTROL UNIT COMPONENTS

OR

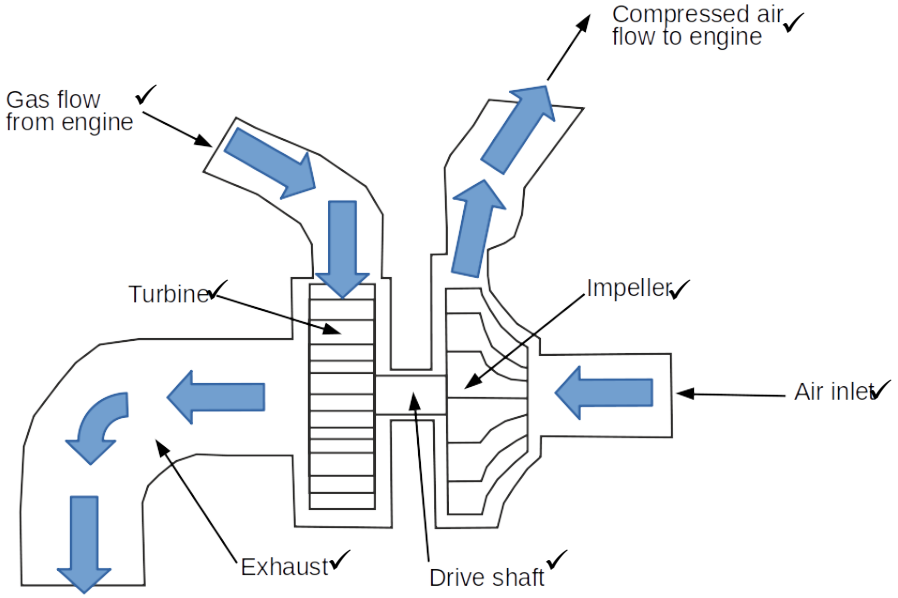
Alternative



GAS TURBINE ENGINE FUEL CONTROL UNIT COMPONENTS

(6)

3.6



TURBOCHARGER

(4)
[22]

QUESTION 4

4.1
- Using propeller governor to increase or decrease propeller pitch during flight.
- When aeroplane goes into climb, blade angle of propeller decreases just enough to prevent engine speed from decreasing.
- Engine maintains power output provided throttle setting is not changed.
- When aeroplane goes into dive, blade angle increases sufficiently to prevent over-speeding, and wit same throttle setting power output remains unchanged.
- If throttle setting is changed instead of changing speed of aircraft by climbing or diving blade angle will increase or decrease as required to maintain constant engine r/min.
- Power output (and not r/min) will therefore change in accordance with changes in throttle setting.
- Governor-controlled constant-speed propeller changes blade angle automatically, keeping engine r/min constant. (Any 4 × 1) (4)

4.2 Actual power✓ delivered to propeller for useful work.✓ (2)

4.3 Piston engine

Piston engine warmed up and running at idle:
- Move mixture control to auto-lean position
- Advance throttle rapidly to accelerate engine to required r/min
- Close throttle
- Move mixture control to auto-rich position
- Advance throttle rapidly to accelerate engine to required r/min
- Close throttle
- Engine should accelerate evenly without any tendency to backfire or to cut
- Record results (Any SIX)

OR

Gas turbine engine running at idle:
- Fully open throttle
- Take time of engine acceleration
- During acceleration check that engine accelerates evenly and smoothly (checking functioning of acceleration control unit)
- Close throttle and check deceleration from maximum revolutions
- Check for vibration during tests
- Record results (6 × 1) (6)

4.4 Inspect the following

- All landing gear units for condition and security of attachment
- Shock absorbing devices for proper fluid level and nitrogen pressure
- Linkage and trusses inspected for excessive wear, fatigue and distortion
- Retracting and locking mechanisms inspected for proper operation
- Hydraulic lines inspected for leakage
- Electrical system inspected for chafing and proper operation of micro switches
- Wheels inspected for cracks, defects, and condition of bearings
- Tyres inspected for wear and cuts, and other defects
- Brakes inspected for wear, defects, and proper adjustment (Any 4 × 1) (4)

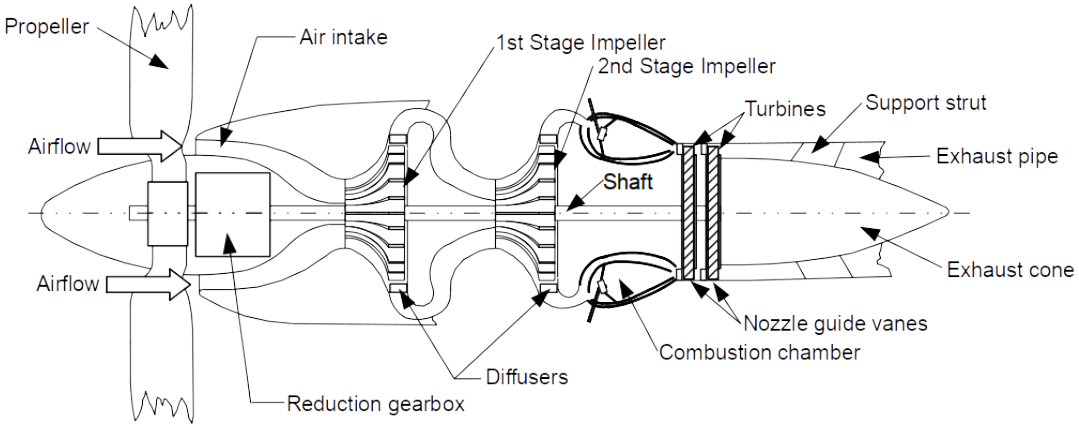
4.5

- Air speed
- Pressure
- Temperature
- Altitude
- Humidity (Any 4 × 1) (4)

[20]

QUESTION 5

5.1



TWO-STAGE CENTRIFUGAL-FLOW TURBOPROPELLOR ENGINE

(Single-stage or a two-stage centrifugal-type compressor)
(4 × 1 for drawing + 4 × 1 for labels) (8)

5.2

- Changing drive to position at right angle to tail rotor drive shaft✓ to drive the anti-torque tail rotor.✓ Reduction gearbox to decrease rotational speed of drive.✓
- Aft end of tailboom.✓ (4)

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5.3 Process of producing lift with rotor blade freely rotating from flow of air through rotor system.✓ Rotor rotation without engine power solely by aerodynamic forces induced by rotor's motion along its flight path.✓ Spinning of rotor by airflow over blades during conditions of power off or power failure (engine-out) generally creates sufficient lift to allow controlled descent and safe landing.✓ (3)

5.4 Imaginary circular plane outlined by rotor blade tips✓ making cycle of rotation normal to axis of rotation.✓ (2)

[17]

TOTAL: 100

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