higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

AUTOMOTIVE REPAIR AND MAINTENANCE
NQF LEVEL 4

22 November 2024

This marking guideline consists of 6 pages.

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QUESTION 1

1.1 B
1.2 D
1.3 B
1.4 B
1.5 C
1.6 D
1.7 C
1.8 B
1.9 C
1.10 A

(10 × 1) **[10]**

QUESTION 2

2.1 False
2.2 True
2.3 True
2.4 True
2.5 False

(5 × 1) **[5]**

QUESTION 3

3.1 G
3.2 D
3.3 L
3.4 A
3.5 I
3.6 C
3.7 E
3.8 K
3.9 F
3.10 M

(10 × 1) **[10]**

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QUESTION 4

4.1

$$N = 1 - \frac{1}{r^{0,4}}$$

$$N = 1 - \frac{1}{6^{0,4}} \checkmark$$

$N = 1 - 0,488$ ✓

$N = 51,17\%$ ✓

$r = (\frac{1}{1-N})^{2,5}$ ✓

$r = (\frac{1}{1-0,6415})^{2,5}$ ✓

$r = 2,789^{2,5}$

$r = 12,99:1$ ✓

N	51.17%	64.15%
r	6:1	12.99 or 13:1

(6 × Calculations)
(1 × Table) (7)

4.2
- The planetary gear system is much more expensive than the conventional gear system.
- Additional components are used to build a simple epicyclic gear train.
- Brake bands used in epicyclic are prone to wear. (3)

4.3
- Input shaft – Connecting the engine and fluid coupling
- Pump/impeller – Creates pressure to move the fluid
- Turbine – Absorbs the centrifugal force in the fluid and transfers it to the output shaft
- Output shaft – Connecting the fluid coupling to the gearbox to transfer motion (4)

4.4
- A dead axle only supports the mass of the vehicle with no driving wheels.
- A live axle contains driving gears within to drive the wheels and support the mass of the vehicle. (2)

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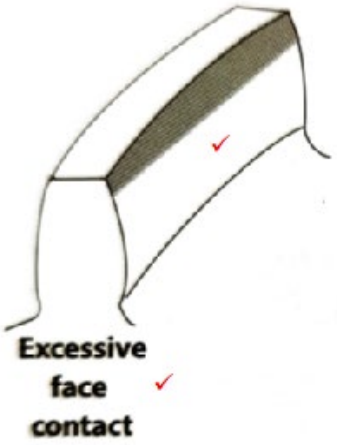
4.5



(1 × sketch and 1 × label) (2)

4.6 A − Front passenger airbag
B − SRS indicator light
C − Driver airbag
D – connector
E − SRS unit
F − Fuse box/relay
G − Cable reel (7)

[25]

QUESTION 5

5.1
- Obtain the manufacturer's specifications.
- Obtain the correct test equipment.
- Connect the test equipment to the engine.
- Start engine and carry out the tests.
- Road-test the vehicle with the test equipment attached and placed inside the vehicle to acquire results.
- Switch off vehicle after tests are completed.
- Compare test findings to the manufacturer’s specifications. (7)

5.2
- Check that the throttle lever opens and closes freely.
- Test the travel of the throttle by depressing the decelerator pedal fully, if it does not have the full travel, it would be visible by an air gap between the lever and the full throttle adjusting screw.
- Release the accelerator pedal and check if the lever returns completely against the stop adjusting screw.
- If any of the travel is not complete, adjust the cable adjustment on the accelerator cable's outer sleeve.
- Loosen the adjusting screw lock nuts.
- Start the engine and adjust the stop adjusting screw to the required idling speed of the engine as indicated in the manufacturer’s manual.
- Ask an assistant to depress the accelerator pedal taking care not to over-rev the engine; adjust the full throttle adjusting screw to the recommended maximum revolutions of the engine.
- Switch off the engine and lock the adjusting screw lock nuts. (Any 7 × 1) (7)

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5.3
- Check for any hydraulic fluid leaks.
- Check for any damaged hydraulic pipes.
- Check the hydraulic fluid level.
- Check the colour of the hydraulic fluid.
- Check for an indication of excessive heat on the steering system.
- Check for damage on the steering components.
- Check for wear on the steering system components.
- Check the suspension and chassis for damage.
- Inspect the front tyres for abnormal wear. (Any 8 × 1) (8)

5.4
- By not referring to the schematics
- By not referring to the wiring diagrams
- By not referring to the workshop manual
- By not referring to the manufacturer's specifications
- Due to a lack of expert knowledge of electronics
- Due to untrained technicians trying to rectify faults
- By using the incorrect tools
- By using the incorrect equipment
- By not knowing how to use the special tooling
- By not knowing how to use the special equipment (Any 8 × 1) (8)

[30]

QUESTION 6

6.1
- With the valves still closed, replace the vacuum pump with the refrigerant container (centre pipe) and place the refrigerant container onto the scale.
- Open the centre valve of the manifold gauge set and the service valve on the refrigerant container.
- Leave the gauge discharge valve closed (HP valve).
- Open the suction valve (LP valve).
- Start the engine and turn on the air-conditioning system.
- Wait for the compressor suction to draw refrigerant into the system.
- Do not exceed the loading pressure of 345 kPa on the gauge, check the scale to see when the prescribed mass of refrigerant is loaded and close the valve.
- Switch off the engine and disconnect the manifold gauge set.

(No marks for vacuum process) (8)

6.2
- The pump motor drives the plunger pump which in turn draws brake fluid from the reservoir and supplies hydraulic pressure to the cylinder.
- The outlet solenoid is a two-position type that opens or closes the brake passage between a wheel cylinder and the reservoir according to commands from the ABS control module.
- The inlet solenoid valve is duty-controlled to reduce brake fluid pulsation for minimum ABS operation noise.
- The reservoir temporarily stores the brake fluid drained from a wheel cylinder when pressure decrease control is performed.
- The damper chamber suppresses brake fluid pulsation which would occur during pressure decrease control in the fluid discharged from the plunger pump to minimise kickbacks of the brake pedal.
- The valve relay controls power supply to the solenoid valves and motor relay in response to a command from the ABS control module.
- The motor relay closes and supplies power to the pump motor in response to a command from the ABS control module during the ABS drive mode operations. (7)

6.3 The warning light will light up briefly for a few seconds when the vehicle engine is started.✓ If the light goes out, it indicates that there is no malfunction and ready to be used.✓ If the light stays on, it indicates a malfunction and the vehicle needs to be taken for inspection and repair.✓ (3)

6.4 As soon as the accelerator pedal is released, the HV ECU initiates regenerative braking.✓ MG2 is turned by the wheels and used as a generator to recharge the HV battery.✓ (2)

[20]

TOTAL: 100

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