higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

AUTOMOTIVE REPAIR AND MAINTENANCE
NQF LEVEL 4

(6021034)

12 March 2018 (Y-Paper)
13:00–16:00

This question paper consists of 8 pages.

NCV

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. Drawings must be done in pencil with a ruler, where applicable.
5. Drawings should not be coloured with liquid ink.
6. Write neatly and legibly.

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QUESTION 1

1.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1.1–1.1.5) in the ANSWER BOOK.

1.1.1 To correct low flank contact, you need to …

A move the pinion away from the centre of the crown wheel.
B move the crown wheel towards the pinion.
C move the crown wheel away from the pinion.
D move the pinion towards the crown wheel centre.

1.1.2 To correct excessive toe contact, you need to …

A move the pinion away from the centre of the crown wheel.
B move the crown wheel towards the pinion.
C move the crown wheel away from the pinion.
D move the pinion towards the crown wheel centre.

1.1.3 To correct excessive heel contact, you need to …

A move the pinion away from the centre of the crown wheel.
B move the crown wheel towards the pinion.
C move the crown wheel away from the pinion.
D move the pinion towards the crown wheel centre.

1.1.4 To correct excessive face contact, you need to …

A move the pinion away from the centre of the crown wheel.
B move the crown wheel towards the pinion.
C move the crown wheel away from the pinion.
D move the pinion towards the crown wheel centre.

1.1.5 The drive side of the crown wheel tooth is the …

A concave side.
B convex side.
C coast side.
D axial side.

(5 × 1) (5)

1.2 Explain the power flow of a two-speed double reduction final drive during low speed. (3)

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1.3 Explain the function of each of the following parts in a reduction-type differential:

1.3.1 Gear shift collar

1.3.2 Pinion bearings

1.3.3 Hypoid pinion gear

1.3.4 Carrier bearings

1.3.5 Hypoid drive gear

(5 × 1) (5)

1.4 Explain how you will perform a pinion-bearing pre-load with a collapsible spacer. (3)

1.5 List FOUR disadvantages of the hydraulic power steering system. (4)
[20]

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QUESTION 2

2.1 Choose a description from COLUMN B that matches an item in COLUMN A. Write only the letter (A–K) next to the question number (2.1.1–2.1.10) in the ANSWER BOOK.

COLUMN A		COLUMN B	
2.1.1	Dampers	A	too much torque will overcome the friction
2.1.2	Turbine sensor	B	difference in speed between pump and turbine
2.1.3	Vehicle speed sensor	C	they do not produce their own voltage
2.1.4	Solenoid valve	D	a sideways movement is placed on the tyre and road surface
2.1.5	Stator	E	is tested very much the same way as sensors and switches
2.1.6	Cornering forces	F	sends messages to the computer which tells the transmission how to perform
2.1.7	Acceleration forces	G	changes direction of the oil from the turbine into the pump
2.1.8	Temperature sensor	H	indicates if the turbine is functioning as desired
2.1.9	Braking forces	I	minimise the torsional vibration within the transmission of power
2.1.10	Torque multiplication	J	an ohmmeter is used to check the resistance of this sensor
		K	kinetic friction and static friction are exposed

(10 × 1) (10)

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2.2 Give TWO advantages of an automatic transmission. (2)

2.3 Name the THREE members of a three-element torque converter. (3)

2.4 Give FIVE advantages of *epicycle gearing* over *conventional gearing.* (5)

[20]

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QUESTION 3

3.1 Indicate whether the following statements are TRUE or FALSE. Choose the answer and write only 'true' or 'false' next to the question number (3.1.1–3.1.5) in the ANSWER BOOK.

3.1.1 Torque convertor's vanes are straight and fluid coupling's vanes are curved.

3.1.2 Too much torque will overcome the friction and the wheels will spin.

3.1.3 The coefficient of friction is determined by the stickiness between the two surfaces.

3.1.4 Even if a 12 V conventional battery is not fully charged, the system will start.

3.1.5 The hybrid system recovers lost energy and uses it as a supplement.

(5 × 1) (5)

3.2 Explain the difference between each of the following:

3.2.1 Coefficient of friction and coefficient of slip.

3.2.2 Kinetic friction and static friction.

3.2.3 A wet compression test and a dry compression test.

3.2.4 Planetary gear and sun gear.

3.2.5 Power balance and mechanical balance.

(5 × 2) (10)

3.3 Explain the operation of a conventional differential when cornering. (5)

[20]

QUESTION 4

4.1 Complete the following sentences by writing down only the missing word or words next to the question number (4.1.1–4.1.6) in the ANSWER BOOK.

hydraulic; controlled; accelerate; interacting; feedback; effort; helps; slowly; mechanism; stationary; steer

Power steering helps drivers (4.1.1 …) vehicles by augmenting the steering effort of the steering wheel. Hydraulic or electric actuators add (4.1.2 …) energy to the steering mechanism. The driver only needs to provide modest (4.1.3 …) regardless of the conditions. Power steering helps considerably when the vehicle is moving (4.1.4 …). The power steering provides some (4.1.5 …) of forces acting on the front wheels to give an ongoing sense of how the wheels are (4.1.6 …) on the road. (6 × 1) (6)

4.2 State FOUR relevant safety practices when working with air-conditioning systems. (4)

4.3 Describe how you will test a fuel supply system for the following:

4.3.1 Fuel flow rate (3)

4.3.2 Operation pressure (3)

4.3.3 Pressure retention (4)

[20]

QUESTION 5

5.1 Give the functions of each of the following parts in an anti-lock braking system:

5.1.1 Wheel speed sensor

5.1.2 Sensor rotor

5.1.3 Electronic control unit

5.1.4 Hydraulic actuator

(4 × 1) (4)

5.2 Explain the impact of forces acting on two cars in the event of a high-speed head-on collision. (5)

5.3 Describe the effect of the crumple zone in a car. (2)

5.4 Compare the *hybrid drivelines* and the *conventional drivelines* in terms of safety. (5)

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5.5 Name TWO appropriate protective clothing items when working on hybrid and electrical vehicles. (2)

5.6 Explain TWO functions of the thermostat in a cooling system. (2)
[20]

TOTAL 100

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