higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

MOTOR TRADE THEORY N3

(11040673)

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09:00–12:00

This question paper consists of 5 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
MOTOR TRADE THEORY N3
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. Start each question on a new page.
5. Use only a black or blue pen.
6. Write neatly and legibly.

FORMULAE:

$\mathrm{CR} = \frac{V_s + V_c}{V_c}$ $V_s = \frac{\pi \times d^2}{4} \times \mathrm{SL}$ $\mathrm{N} = 1 - (\frac{1}{r})^{0,4}$

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QUESTION 1

1.1 The total swept volume of a six-cylinder engine is 4,2 litres and the compression ratio in the cylinders is 9:1.

Calculate the free volume of one cylinder. (4)

1.2 An engine has a cylinder diameter of 120 mm and a stroke length of 180 mm. It is equipped with flat-top pistons and a hemispherical combustion chamber with the same diameter as the cylinder is situated in the cylinder head. The volume of the sphere is $3V = 4\pi R^3$.

Calculate:

1.2.1 The clearance volume (2)

1.2.2 The swept volume (2)

1.2.3 The compression ratio (3)

1.3 What are the purposes of the valve springs in a four-stroke internal combustion engine? (2)

1.4 Make neat, labelled sketches to illustrate the difference between a sodium valve and a masked valve. (3 + 3) (6)

1.5 What is the function of a masked valve? (2)

1.6 1.6.1 Give TWO advantages of a sodium valve. (2)

1.6.2 Give TWO disadvantages of a sodium valve. (2)

[25]

QUESTION 2

Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (2.1–2.10) in the ANSWER BOOK.

2.1 The power balance of an engine will change if the compression ratio is increased.

2.2 The volumetric efficiency of an engine can be more than 100%.

2.3 Increasing the compression ratio will increase the mechanical efficiency of an engine.

2.4 Valve overlap occurs when both valves are open at the bottom dead centre.

2.5 When the compression ratio of an engine is increased, more engine wear will occur.

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2.6 A differential lock can only be fitted to rear-wheel-drive vehicles.

2.7 By increasing the compression ratio of the engine, the compression pressure will increase as well.

2.8 An advantage of a diagnostic centre is that mechanics should be trained to use the equipment.

2.9 A workplace must have a fire extinguisher as a precautionary measure.

2.10 Tools should only be issued against a valid authorisation.

(10 × 1) **[10]**

QUESTION 3

Tabulate FIVE differences between a *fluid coupling* and a *torque converter*.

FLUID COUPLING	TORQUE CONVERTER
3.1	
3.2	
3.3	
3.4	
3.5	

(5 × 2) **[10]**

QUESTION 4

4.1 Give 5 causes of steering pump noise in a power-steering system and explain how each fault must be repaired (10)

4.2 Name THREE types of camshaft drives. (3)

4.3 Give TWO advantages of each drive named in QUESTION 4.2. (2 × 3) (6)

4.4 Explain the basic operating principle of a differential lock. (6)

[25]

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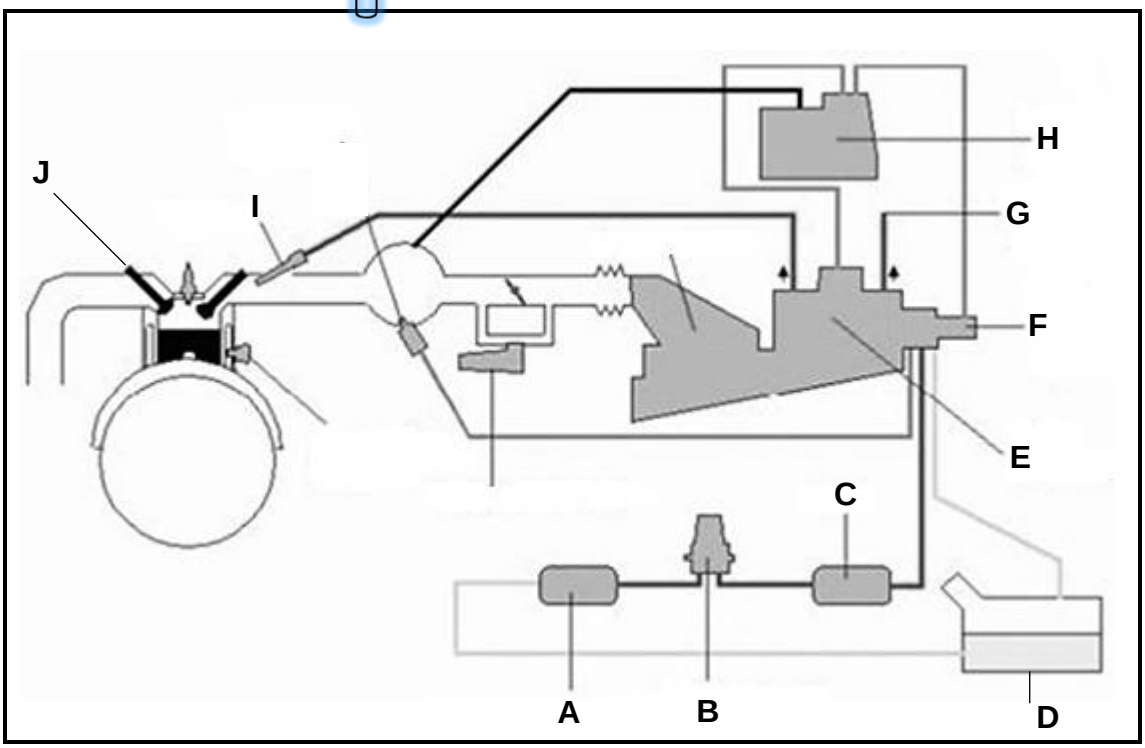
QUESTION 5

5.1 Give FIVE advantages of a fuel-injection system over a conventional carburettor system. (5 × 2) (10)

5.2



Label the sketch of a mechanical constant-spray injection by writing only the answer next to the letter (A–J) in the ANSWER BOOK. (10 × 1) (10)

5.3 Draw a neat valve-timing diagram of a four-stroke engine and show the following:

- Inlet stroke
- Compression stroke
- Power stroke
- Exhaust stroke
- TDC and BDC (10)

[30]

TOTAL: 100

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