higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

MOTOR TRADE THEORY N3

(11040673)

29 November 2023 (X-paper)
09:00–12:00

Drawing instruments and nonprogrammable calculators may be used.

This question paper consists of 6 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. Use only a black or blue pen.
5. Write neatly and legibly.

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QUESTION 1

1.1 Calculate the cylinder diameter of an engine with a compression ratio of 17:1, a stroke length of 125 mm and a clearance volume of 230 $cm^{3.}$

Use the following formulae:

$$V = \frac{\pi D^2}{4} X\ Ls \qquad\qquad Cr = \frac{Vs+Vc}{Vc}$$

(6)

1.2 State THREE reasons for conducting a compression test on an internal combustion engine. (3)

1.3 State THREE methods that may be used to increase the compression ratio on an engine. (3)

1.4 Explain THREE effects that increasing the compression ratio may have on an engine. (3)

1.5 Name THREE main types of mechanically driven superchargers. (3)

1.6 How is the supercharger driven? (1)

1.7 How is the turbocharger lubricated? (1)

[20]

QUESTION 2

2.1. Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (2.1.1–2.1.7) in the ANSWER BOOK.

2.1.1 The hybrid vehicle normally uses 6 V and 12 V batteries.

2.1.2 CVT in motor vehicle terminology refers to continuously variable transmission.

2.1.3 Total bearing preload is set and checked on the pinion bearings of the final drive.

2.1.4 The Two types of dynamometers commonly in use are brake type and inertia type dynamometers.

2.1.5 The acronyms CDI and TIS are abbreviations for Computerised Distributorless Ignition and Transistorised Ignition System.

2.1.6 To allow the stator in a fluid clutch to move in one direction it is mounted on a one-way clutch.

2.1.7 An on-board charger on the hybrid vehicle converts DC current to AC current.

(7 × 1) (7)

2.2 FIGURE 1 below shows the parts of an internal combustion engine.

Name the parts labelled A–G in the ANSWER BOOK. (7)

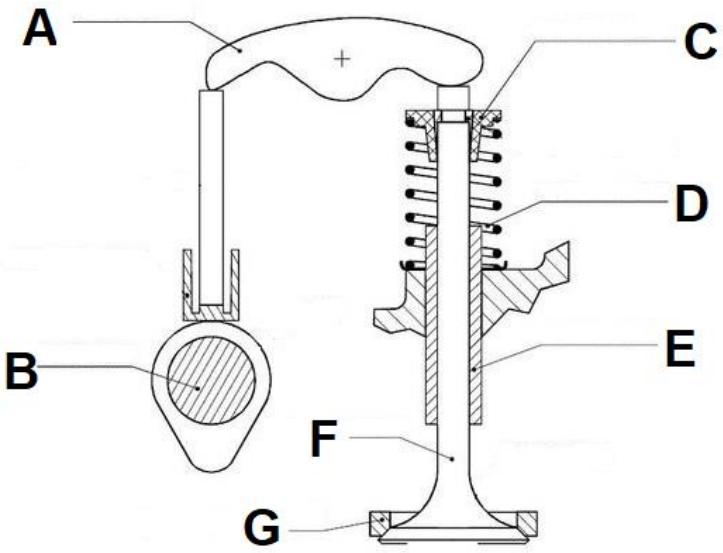

FIGURE 1

2.3 Explain what is meant by the term *cross flow head.* (2)

2.4 Name TWO advantages of using four valves per cylinder on an internal combustion engine. (2)

2.5 Name TWO types of electronic fuel injection systems used on motor vehicle engines. (2)

[20]

QUESTION 3

3.1 Explain the operation of the electronic fuel injection system used on motor vehicles. (8)

3.2 State TWO symptoms of a faulty fuel pump on a fuel injection system mentioned in QUESTION 3.1. (2)

3.3 Explain the operation of a distributor-less ignition system. The following must be included in the explanation:

- The controls
- Coils
- Sensors (6)

3.4 FIGURE 2 below shows the parts of an internal combustion engine.

Name the parts labelled A−D in the ANSWER BOOK. (4)

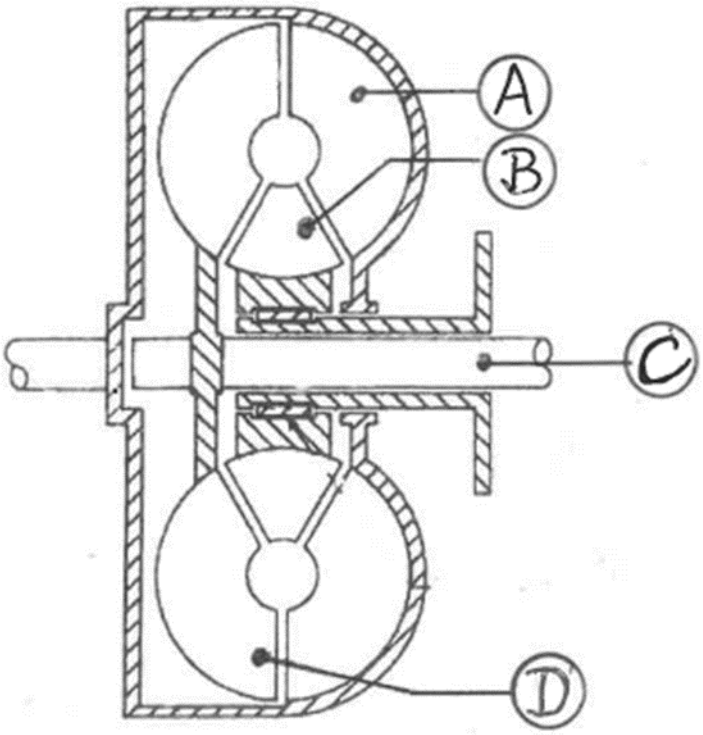

FIGURE 2

[20]

QUESTION 4

4.1 State ONE function of each of the following parts of an automatic gearbox:

4.1.1 Oil pump

4.1.2 Valve body

4.1.3 Clutches

4.1.4 Brake band

4.1.5 Planetary gears

(5 × 1) (5)

4.2. Make a neat, labelled sketch of the planetary gears used in an automatic gearbox. (5)

4.3 State TWO advantages and TWO disadvantages of the *electronic automatic gearbox* when compared to a *conventional automatic gearbox*. (2 × 2) (4)

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4.4 State FOUR visual checks that must be performed before dismantling a power-assisted steering system. (4)

4.5 How often should the power steering fluid and belts be checked on a hydraulic power steering system? (1)

4.6 What does the term *on-board diagnosis* mean? (1)
[20]

QUESTION 5

5.1. FIGURE 3 below shows the parts of a motor vehicle.

Name the parts labelled A–H in the ANSWER BOOK. (8)

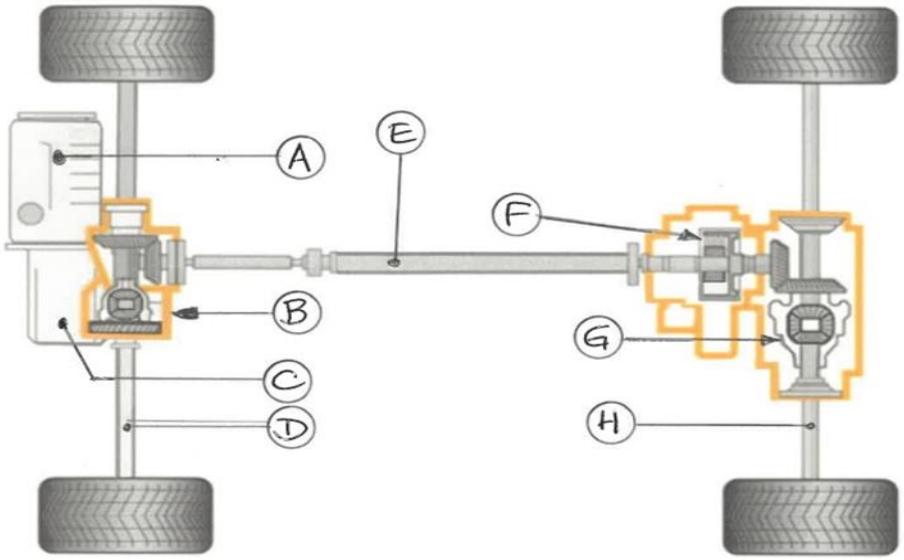

FIGURE 3

5.2 State the drive type indicated in the sketch in FIGURE 3 above. (1)

5.3 State FOUR advantages of a limited slip differential. (4)

5.4 After a technician repaired a vehicle fitted with an on-board computer, error codes must be cleared. List the steps that must be followed, to clear the fault error codes. (6)

5.5 When the car's computer detects a problem or abnormal function it may revert to *limp-mode*. To what is the r/min typically limited for a vehicle in limp-mode? (1)
[20]

TOTAL: 100

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