



higher education & training

Department:
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REPUBLIC OF SOUTH AFRICA

T450(E)(A10)T

NATIONAL CERTIFICATE

DIESEL TRADE THEORY N3

(11041823)

**10 April 2018 (X-Paper)
09:00–12:00**

This question paper consists of 6 pages.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA
NATIONAL CERTIFICATE
DIESEL 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. Write neatly and legibly.
-

QUESTION 1

- 1.1 An engine has a clearance volume of 8 500 mm³ and a stroke length of 105 mm which gives a compression ratio of 10: 1.

Calculate the diameter of the cylinder by using the following formulae:

$$Cr = \frac{V_s + V_c}{V_c} ; V_s = \left[\frac{\pi D^2}{4} \right] \times L_s \quad (5)$$

- 1.2 An engine has an air standard efficiency of 62%.

Calculate the compression ratio of the engine by using the following formula:

$$\eta = 1 - \left[\frac{1}{R} \right]^{0.4} \quad (4)$$

- 1.3 Draw a valve timing belt drive system between a crankshaft and an overhead cam shaft.

Show the following in the drawing:

Timing marks, Crankshaft gear, Injector pump drive gear, Tensioner pulley, Cam shaft gear and Cam belt

(8)

- 1.4 Give THREE disadvantages of timing belt drives.

(3)

[20]

QUESTION 2

- 2.1 List THREE factors that will influence the power balance of an engine. (3)

- 2.2 State FIVE important reasons for valve rotation in the cylinder head. (5)

- 2.3 Give TWO reasons for the importance of the interference angle of a valve. (2)

- 2.4 Explain the operation of a plunger unit in an inline injector pump when the vehicle is accelerating (5)

- 2.5 State FIVE negative effects on an engine that has a too small valve clearance. (5)

[20]

QUESTION 3

- 3.1 FIGURE 1 shows an Epicyclic gear set.
Label items (A–D) in your ANSWER BOOK.

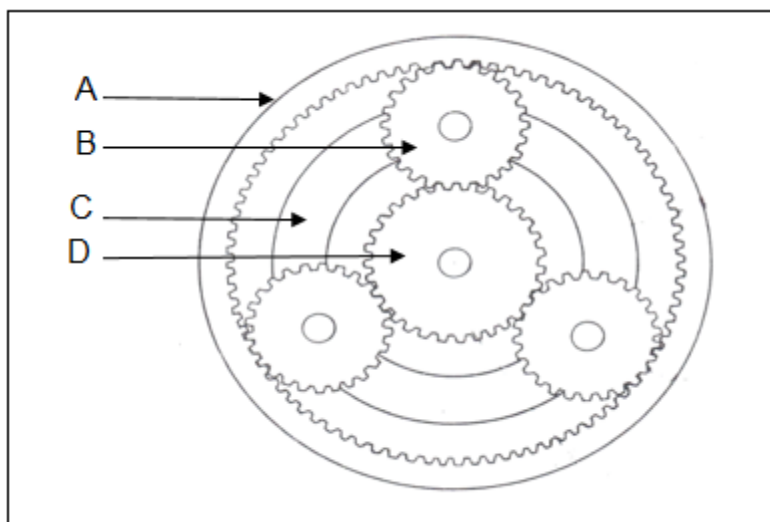


FIGURE 1

(4)

- 3.2 Give FOUR mechanical advantages of an epicyclic gear set compared to a manual gear set.

(4)

- 3.3 FIGURE 2 shows the layout of a torque converter. Label items (A–E) in your ANSWER BOOK.

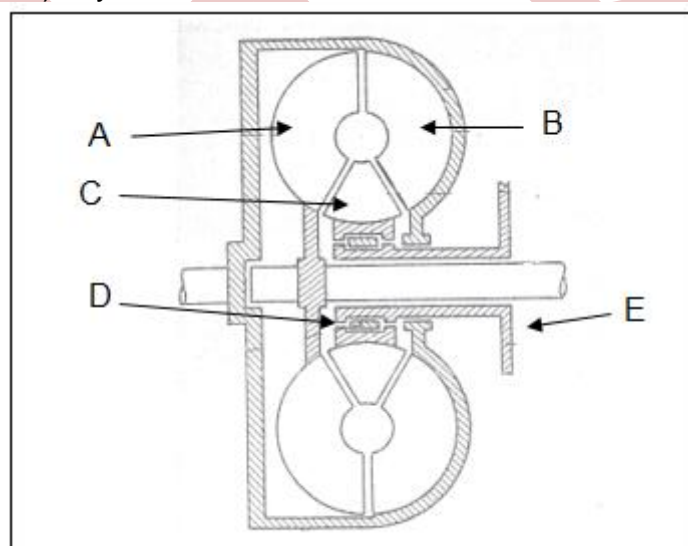


FIGURE 2

(5)

- 3.4 Explain the operation of the torque converter when the vehicle accelerates.

(5)

- 3.5 Give TWO advantages of an overdrive unit compared to a manual gearbox.

(2)

[20]

QUESTION 4

- 4.1 Complete the following paragraph by using the words in the list below. Write only the missing word or words next to the question number (4.1.1–4.1.6) in the ANSWER BOOK.

injector pump; fuel tank; camshaft injectors; combustion chamber;
lift pump; compression ignition; camshaft; half; twice

Diesel engines are also referred to as (4.1.1) ... engines. Diesel engines use a (4.1.2) ... and (4.1.3) ... to supply fuel to the cylinders. The injector pump is driven from the (4.1.4) ... via the (4.1.5) ... The injector pump rotates (4.1.6) ... the speed of the crankshaft.

(6)

- 4.2 Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–G) next to the question number (4.2.1–4.2.5) in the ANSWER BOOK.

| COLUMN A | | COLUMN B | |
|----------|---|----------|-----------------------|
| 4.2.1 | Injectors break up the diesel fuel into small droplets | A | ignition delay period |
| 4.2.2 | Process that occurs when fuel changes from a liquid into a gas | B | after burning |
| 4.2.3 | Measurement of the ease with which liquid vaporises | C | diesel knock |
| 4.2.4 | Combustion preparation period during which the particles of the injected fuel evaporate | D | volatility |
| 4.2.5 | When the ignition delay period takes too long | E | atomisation |
| | | F | vaporisation |
| | | G | cetane rating |

(5 × 1)

(5)

- 4.3 Explain how spill timing is performed on an injector after it is refitted.

(4)

- 4.4 State ONE function of the following parts in a diesel fuel system.

4.4.1 Primary fuel filter

(1)

4.4.2 Secondary fuel filter

(1)

4.4.3 Water trap

(1)

- 4.5 Give TWO reasons for the importance for the return flow of fuel in the injector

(2)

[20]

QUESTION 5

- 5.1 Tabulate FIVE mechanical differences between a LIMITED SLIP DIFFERENTIAL and a CONVENTIONAL DIFFERENTIAL. (5)
- 5.2 List FIVE requirements a site must meet for erecting a service station with a motor vehicle repair workshop. (5)
- 5.3 An upset customer returns his truck to the garage because of poor workmanship.
- 5.3.1 Explain how the receptionist will address the concerns of the unhappy customer. (4)
- 5.3.2 List FOUR activities that must be carried out by the workshop receptionist to ensure customer satisfaction relating to repairs on the vehicle. (4)
- 5.4 Give TWO reasons why a customer should sign a job card. (2)
- [20]**

TOTAL: 100