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Department:
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REPUBLIC OF SOUTH AFRICA

T450**(E)**(N28)T

DIESEL TRADE THEORY N3

(11041823)

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09:00–12:00

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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.

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QUESTION 1

1.1 An engine has a cylinder diameter of 65 mm, a stroke length of 95 mm and a compression ratio of 11 : 1. The combustion chamber has the same diameter as the cylinder.

Use the formulae below and answer the following questions:

$$Cr = \frac{Vs + Vc}{Vc} \qquad Vs = \frac{\pi d^2}{4} \times Ls$$

1.1.1 Calculate the swept volume in mm³. (3)

1.1.2 The cylinder head of the engine is send to a machine workshop to remove 1,27 mm of the cylinder head from the combustion chamber. When this metal is removed, the engine will have a new compression ratio.

Calculate the new compression ratio after the metal has been removed from the combustion chamber. (6)

1.1.3 Calculate the percentage increase in the compression ratio. (3)

1.2 Explain the operation of the vibration damper when an engine begins to accelerate. (5)

1.3 Give THREE advantages of epicyclic gearing over conventional gearing. (3)
[20]

QUESTION 2

2.1 Name the parts of a three-element torque convertor. (3)

2.2 Explain *torque multiplication* when a vehicle pulls away. (2)

2.3 Explain the operation of an automatic gearbox to obtain reverse gear (3)

2.4 Give FOUR advantages of an automatic gearbox over a conventional gear box. (4)

2.5 State TWO functions of each of the following parts in a control system of an automatic gearbox:

2.5.1 Oil pump (2)

2.5.2 Valve body (2)

2.6 List the FOUR elements of a single epicyclic gear train. (4)
[20]

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QUESTION 3

3.1 FIGURE 1 below shows a sectional view of a plunger unit of an inline injection pump.

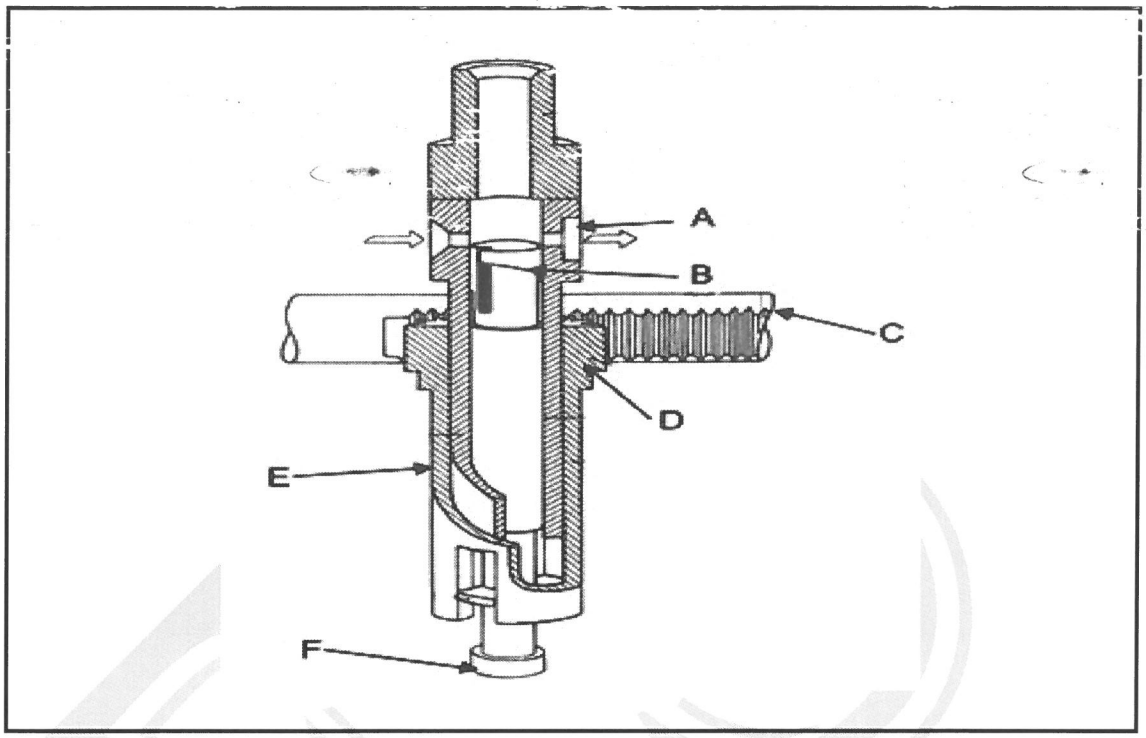

FIGURE 1

3.1.1 Label the parts of the plunger unit by writing the answer next to the letter (A–F) in the ANSWER BOOK. (6)

3.1.2 Explain the operation of the plunger unit when the vehicle is accelerating. (5)

3.2 List FIVE types of pressure in a DPA injector pump during operation. (5)

3.3 Complete the following sentences by using the words given in the list below. Write only the missing word or words next to the question number (3.3.1–3.3.4) in the ANSWER BOOK.

30 degrees; calibration; 60 degrees; 90 degrees; phasing

3.3.1 ... describes the timing interval, measured in degrees, between each successive injection of fuel from the injection pump.

3.3.2 On a four-cylinder CI engine the injection phases should be every .... of pump drive rotation.

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3.3.3 On a six-cylinder CI engine the injection phases should be every ... of pump drive rotation.

3.3.4 ... describes the procedure of adjusting the quality of fuel that each pump element delivers to each particular injector.

(4 x 1) (4)
[20]

QUESTION 4

4.1 FIGURE 2 below shows a sectional view of a differential lock.

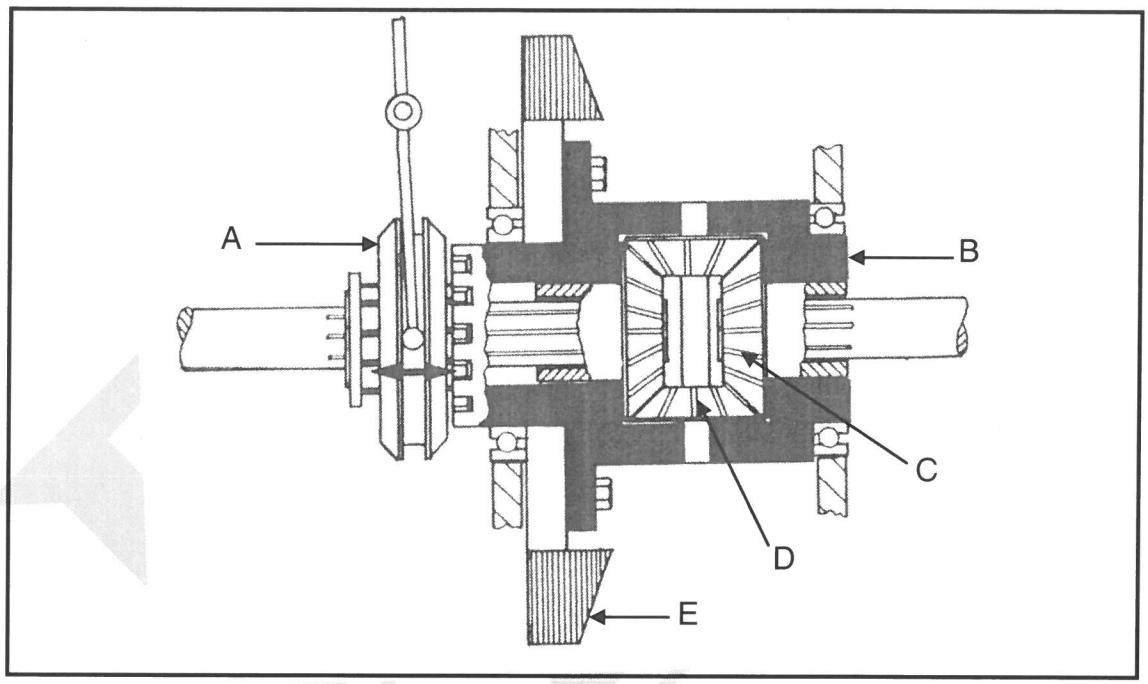

FIGURE 2

4.1.1 Label the parts of the differential lock by writing the answer next to the letter (A–E) in the ANSWER BOOK. (5)

4.1.2 Explain the engagement process to lock the differential. (5)

4.1.3 Explain the operation of the differential when it is engaged in the locked position. (3)

4.2 Differentiate between the following preloads on a differential:

4 2.1 Total preload (2)

4 2.2 Pinion preload (2)

4.3 Explain how a tooth contact pattern on the crown wheel of a final drive is performed. (3)
[20]

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QUESTION 5

5.1 FIGURE 3 below shows a sectional view of a valve assembly.

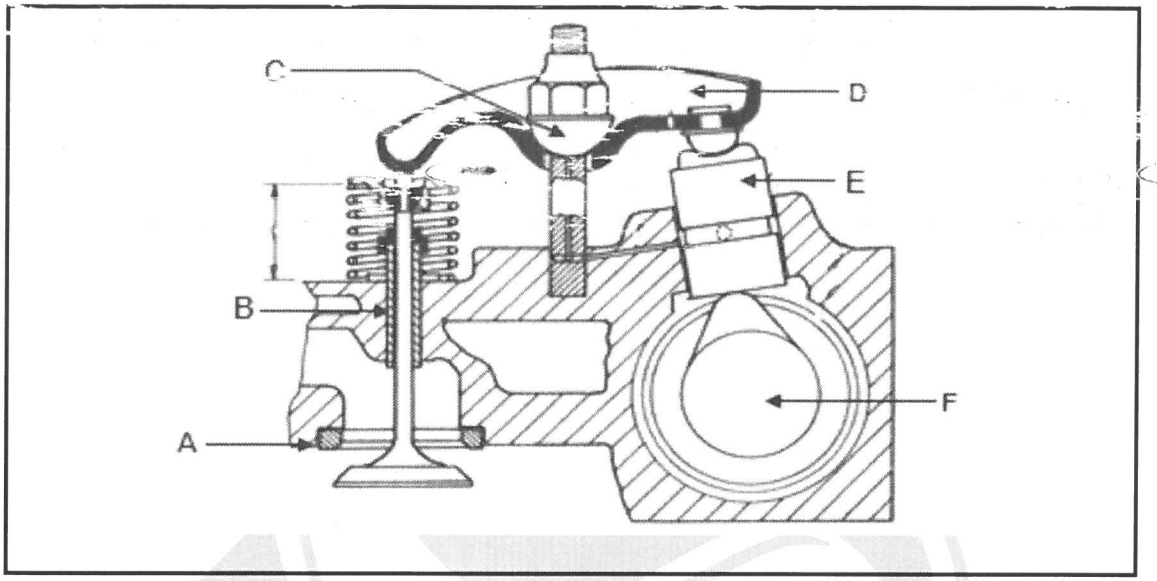

FIGURE 3

5.1.1 Label the parts of the valve assembly by writing the answer next to the letter (A–F) in the ANSWER BOOK. (6)

5.1.2 Name the valve assembly in FIGURE 3. (1)

5.1.3 Give FIVE advantages of the valve assembly in FIGURE 3. (5)

5.2 Draw and label a sectional view of a positive valve rotator on a valve stem. (5)

5.3 List THREE negative effects that will occur if the exhaust valve clearance on a diesel engine is set small. (3)

[20]

TOTAL: 100

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