

**T370(E)(N12)T
NOVEMBER EXAMINATION
NATIONAL CERTIFICATE
DIESEL TRADE THEORY N2**

(11040192)

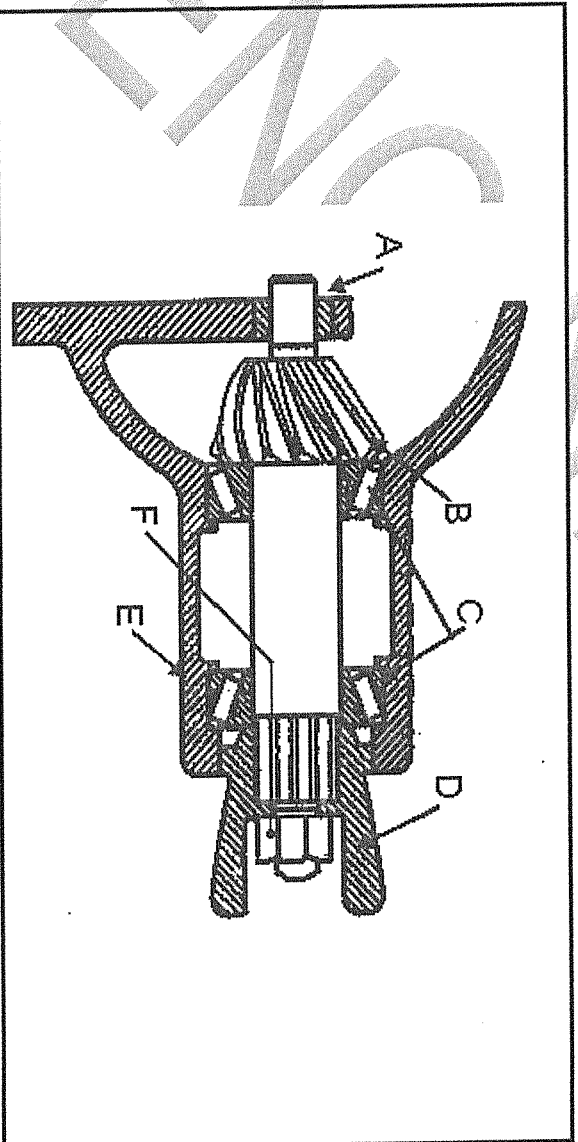
**12 November 2014 (Y-Paper)
13:00–16:00**

This question paper consists of 5 pages.

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. ALL sketches must be fully labelled.
 5. Keep subsections of questions together and DRAW a LINE after each completed question.
 6. Write neatly and legibly
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QUESTION 2

- 2.1 Explain the power flow through the differential and final drive when a vehicle is moving around a corner. (Sketches may be used to aid in the explanation.) (8)
- 2.2 State TWO functions of the final drive as used in heavy-duty vehicles. (2)
- 2.3 Name TWO functions of the differential as used in heavy-duty vehicles. (2)
- 2.4 The sketch below shows a pinion as it is used in the final drive. Label the sketch by writing the names next to the letters (A–F) in the ANSWER BOOK. (2)



(Labels are ONE mark each; 6 x 1) (6)

- 2.5 Use the above sketch to explain where the pinion depth adjustment shims are fitted. (2)
[20]

3.5 Name the TWO types of balancing and which type needs to be done first during wheel balancing. (3)

3.6 What is the point of ensuring that the 'Ackerman principle' is correct when checking wheel alignment? (1)

3.7 What is the purpose of the dot on the outer wall of a tyre? (1)
[20]

QUESTION 4

4.1 Draw a neat sectional view of a double piston wheel cylinder as is used on the hydraulic rear wheel brakes of trucks. (8)

4.2 Give TWO reasons why 'brake pedal free play' is needed on a brake system. (2)

4.3 Give THREE advantages of using a tandem master cylinder on a vehicle. (3)

4.4 Can you use a brake master cylinder consisting of a check valve on disk brakes? Motivate your answer. (3)

4.5 Explain which procedures should be followed when a truck's drum brakes are adjusted. (4)
[20]

QUESTION 5

5.1 Make a neat sketch of a paper element air cleaner. (8)

5.2 Name TWO functions of an air cleaner. (2)

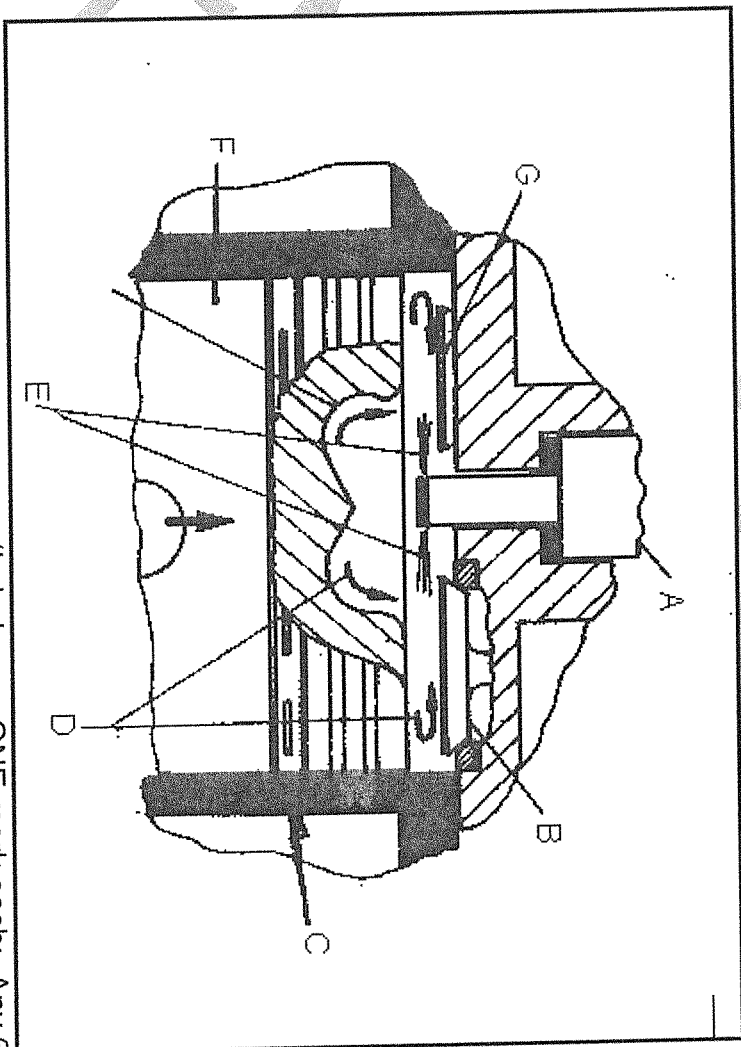
5.3 What is meant by the term *cetane rating* when referring to diesel fuel? (1)

5.4 Name any TWO methods that assist in increasing air turbulence during the intake stroke of diesel engines. (2)

QUESTION 6

6.1 The sketch below shows a combustion chamber as is found in diesel engines.

Label the sketch by writing the name for each part next to the letter (A–G) in the ANSWER BOOK.



(Labels are ONE mark each; Any 6 x 1) (6)

6.2 Is the above-mentioned combustion chamber a single swirl or a double swirl combustion chamber? Motivate your answer. (2)
[8]

TOTAL: 100

MARKING GUIDELINE

NATIONAL CERTIFICATE

NOVEMBER EXAMINATION

DIESEL TRADE THEORY N2

12 NOVEMBER 2014

This marking guideline consists of 8 pages.

Spur gears
Helical gears
Double helical gears

(3 x 1) (3)

1.3 * Advantages of spur gears:

Have high mechanical efficiency
Relatively cheap to manufacture
Have reduced side thrust

(1 x 1) (1)

* Disadvantages of spur gears:

Gears noisy in operation
Gears must be stationary when engaged or need double declutch

(1 x 1) (1)

* Advantages of helical gears:

More than one tooth in contact at any given time. Therefore stronger
Gears less noisy in operation

(1 x 1) (1)

* Disadvantages of helical gears:

More expensive to manufacture
Do not slide easily into mesh

(1 x 1) (1)

* Advantage of double helical gears:

Stronger and can transmit more torque

(1 x 1) (1)

* Disadvantage of double helical gears:

Very expensive to manufacture

(1 x 1) (1)
[12]

gear(s) which mesh (es) between the sun gears. The planetary gears rotate around the cross-pin whilst the cross-pin is fixed onto the differential carrier while cornering; but are stationary about the cross-pin when the vehicle is moving straight ahead. By this means, the drive can still be obtained whilst the vehicle is turning the corner (turning around the corner). (8)

2.2

- Provides a constant gear reduction to enable the vehicle to pull away from rest.

- Changes the direction of the drive through 90° angle (2)

2.3

- Enables the drive wheels to turn at different velocities.
- Prevents unnecessary wear on parts and tyres. (2)

2.4 Labels for parts:

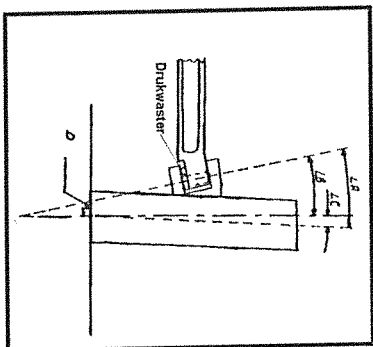
- A = Pinion pilot bearing
- B = Pinion
- C = Taper bearings
- D = Flange
- E = Differential housing
- F = Preload adjustment nut.

(Labels are ONE mark each; 6 x 1) (6)

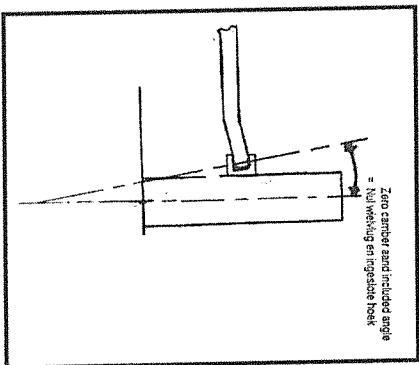
2.5 On the pinion shaft, behind the pinion gear. (2)
[20]

3.2

(a)



(b)



(2 x 3) (6)

3.3

- Recirculating ball and nut steering box
- Worm and roller steering box

(2)

3.4

The steering box on heavy-duty vehicles does the following:

- Provides a reduction in torque to enable the driver to use a small effort to turn the wheels of a truck;
- Enables the driver to move the truck straight as well as to change direction.

(2)

Two pistons compensate for unequal displacement of fluid in chamber.
Two separate master cylinder circuits are placed together and operated by a common push rod.

(Any 3 x 1) (3)

4.4

No; that is because the purpose of the check valve is to enable a predetermined amount of pressure into the brake pipes. Therefore, if a check valve should be used, then the brakes will be permanently and partially applied on the disk brakes.

(3)

4.5

Lift the vehicle up in the air the wheels to be adjusted to enable them to be turned by hand; tightly adjust by means of an adjuster each lining against the drum until that wheel cannot be turned by hand; then, just loosen the adjuster until the wheel can be turned by hand, in the future. Remember that each wheel consists of two adjusters to be adjusted.

(4)
[20]



A = Air Cleaner cover
 B = Wing nut
 C = Air Cleaner casing
 D = Air intake
 E = Air intake into intake manifold
 F = Paper element

(Labels are ONE mark each; Any 4 x 1 + Correctness = 4 points) (8)

5.2

- Reduces engine noise.
- Prevents all types of filth (dust, insects, vapour, etc.) from entering the engine.

 (2)

5.3 It is that property of diesel which measures its resistance against combustion under pressure. (1)

5.4

- By using a masked intake valve
- Design the intake manifold in such a way as to increase the turbulence of air during the intake stroke.

 (2)

5.5

- Due to fine tolerances of equipment and parts a constant temperature must be maintained.
- Owing to diesel fuel which can cause fire hazards, extractor fans must be used.
- Care must be taken when handling or storing fuel; and also, remember that diesel oil is slippery; avoid smoking or rather do NOT smoke in the test room at all.
- The test room must be equipped with the correct tools and care must be taken that testing equipment is calibrated as specified.

 (Any 3 x 1) (3)

QUESTION 6

6.1

- A = Injector
- B = Exhaust valve
- C = Cylinder sleeve
- D = Airflow
- E = Injection spray pattern
- F = Piston
- G = Intake valve

(Labels are ONE mark each; Any 6 x 1) (6)

6.2

Double swirl, piston combustion chamber; it is a chamber designed to allow air swirl inside the combustion chamber, as well as, on top of the piston. (2)
[8]

TOTAL: 100