higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE

DIESEL TRADE THEORY N2

(11040192)

30 July 2021 (X-paper)
09:00–12:00

Drawing instruments may be used.

This question paper consists of 8 pages.

104Q1G2130

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
DIESEL TRADE THEORY N2
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. Only use a black or blue pen.
6. Write neatly and legibly.

QUESTION 1

Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1–1.10) in the ANSWER BOOK.

1.1 The basic characteristics of brake fluid are …

A high boiling point.
B low viscosity.
C compatibility with rubber and metal parts.
D all the above.

1.2 Incorrect steering axis inclination (S.A.I.) causes …

A poor recovery of steering wheel after making a turn.
B the brake pedal being very hard to push down.
C generation of braking effect on tight corners.
D brake grab.

1.3 The compression ratio for a diesel engine usually lies in the range of …

A 6–10.
B 10–15.
C 15–25.
D 25–40.

1.4 Offers the advantage of easy starting and high thermal efficiency, with low fuel consumption:

A Indirect injection
B Direct injection
C Valve Leading
D None of the above

1.5 The purpose of a differential in a vehicle is to ...

A allow the wheels of a vehicle to brake.
B deliver equal amounts of torque to each road wheel.
C synchronise the speed of the gear selected.
D support the weight of the wheels.

1.6 One of the functions of a synchroniser unit is to ...

A lock the output gear to the counter shaft.
B allow an equal pull force on each wheel for the emergency brake.
C increase pressure in the system to improve braking force.
D bring two gears to the same speed before they are engaged.

1.7 Can operate through larger angles where large angle steering movements are required:

A Universal joint.
B Slip joint.
C Constant velocity joint.
D All the above.

1.8 ... is part of the basic fuel system components.

A Fuel pump
B Steering gearbox
C Brake drum
D Exhaust gas analyser

1.9 ... is a type of braking calliper that uses two pistons.

A Floating calliper
B Fixed calliper
C A and B
D None of the above

1.10 The independent rear axle type of suspension which uses coil springs is ...

A transverse swing arm.
B solid axle.
C CV joint.
D none of the above.

(10 × 1) **[10]**

QUESTION 2

Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (2.1–2.5) in the ANSWER BOOK.

2.1 Back leakage in an injector nozzle is often caused by wear between needle valve and its holder.

2.2 A pintle nozzle injector has a single hole nozzle, with the end of the needle extended to form a pin that protrudes through the hole in the nozzle body.

2.3 Positive camber angle refers to the inward tilt of front wheels, when viewed from the front.

2.4 Bleeding is a required process for removal of air from a hydraulic braking system.

2.5 Coil springs are used in a rear wheel drive, solid axle suspension of heavy-duty trucks.

(5 × 1) **[5]**

QUESTION 3

3.1 Explain TWO functions of a final drive used in heavy duty vehicles. (2)

3.2 Explain the purpose of a slip joint in a Hotchkiss drive assembly. (2)

3.3 Name TWO parts of a differential. (2)

3.4 Differentiate with examples, between a *dead* and *live* axle in a conventional final drive. (4)

3.5 FIGURE 1 below shows a final drive and differential. Name the parts labelled (A–J) in the ANSWER BOOK.

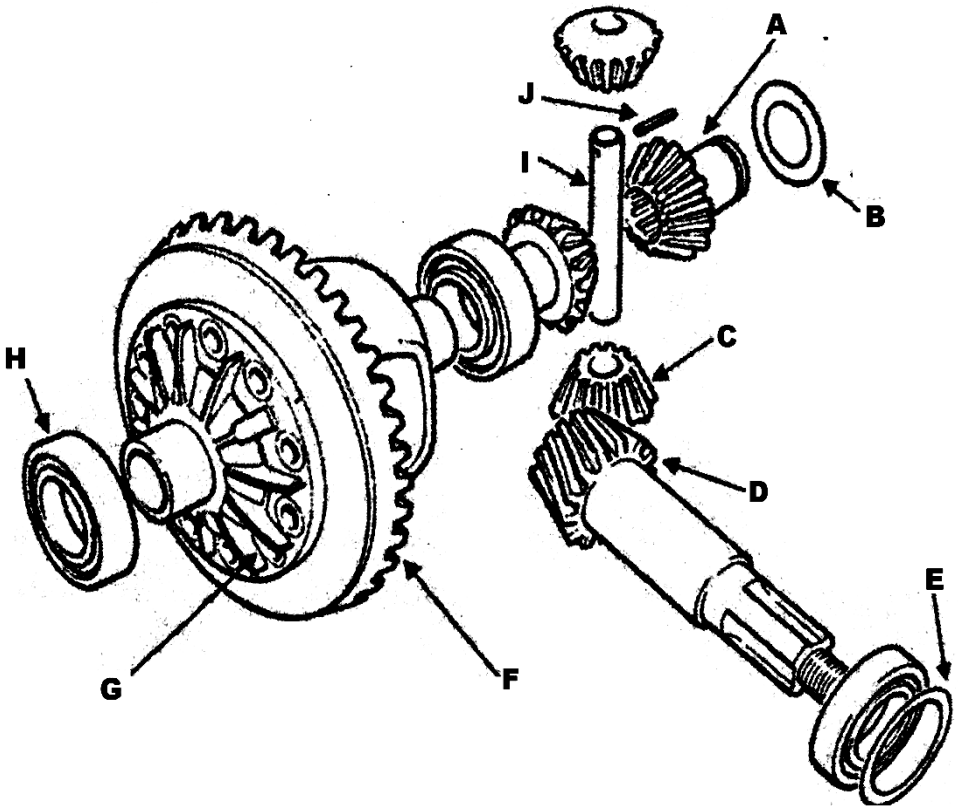

FIGURE 1 (10)

[20]

QUESTION 4

4.1 State TWO advantages of the use of helical gears in a gear box. (2)

4.2 Identify the components to show power flow in a four-speed gearbox when third gear is selected. (4)

4.3 Name THREE components of a selector shift mechanism. (3)

4.4 Study FIGURE 2 below that show the construction of a synchroniser unit used in a four-speed gearbox and answer the questions that follow.

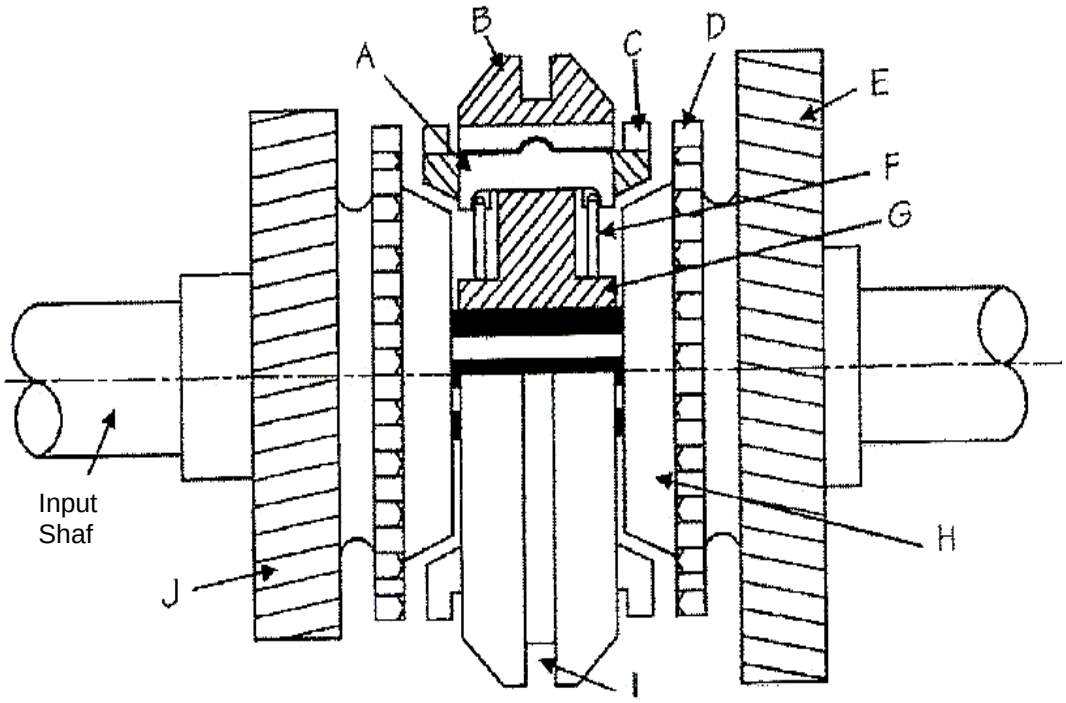

FIGURE 2

4.4.1 Identify the type of synchroniser unit shown in FIGURE 2 above. (1)

4.4.2 Name the parts labelled A–J in FIGURE 2 above.) (10)
[20]

QUESTION 5

5.1 One of the main differences between diesel engines and petrol engines is how engine speed is regulated.

5.1.1 Explain how engine speed is regulated in a diesel engine. (2)

5.1.2 Explain how engine speed is regulated in a petrol engine. (2)

5.2 Draw a neat, labelled sketch of a fuel supply system used in a four-cylinder four-stroke diesel engine.

Include the following components on the sketch: fuel tank, fuel return pipe, water trap filter or primary filter, secondary filter, pressure relief valve, high pressure fuel lines and injectors. (8)

5.3 Name FOUR types of diesel fuel injector nozzles used in diesel engines. (4)

5.4 Explain the functions of a diesel fuel injector. (2)

5.5 Explain how to improve turbulence or swirl of intake air during the inlet stroke of a diesel engine. (2)
[20]

QUESTION 6

6.1 Name TWO components of a drum brake assembly. (2)

6.2 Explain the purpose of a hand brake compensator for a park brake mechanism. (2)

6.3 State FOUR qualities of a good brake fluid. (4)

6.4 Diagnose the brake system and state TWO causes for each of the following problems.

6.4.1 Brake pedal feels spongy

6.4.2 Brake squeals when applied

6.4.3 Brake pedal is hard to push down

6.4.4 Parking brake does not release.

(4 × 2) (8)

6.5 FIGURE 3 below shows a brake system component. Study the figure and answer the questions that follow:

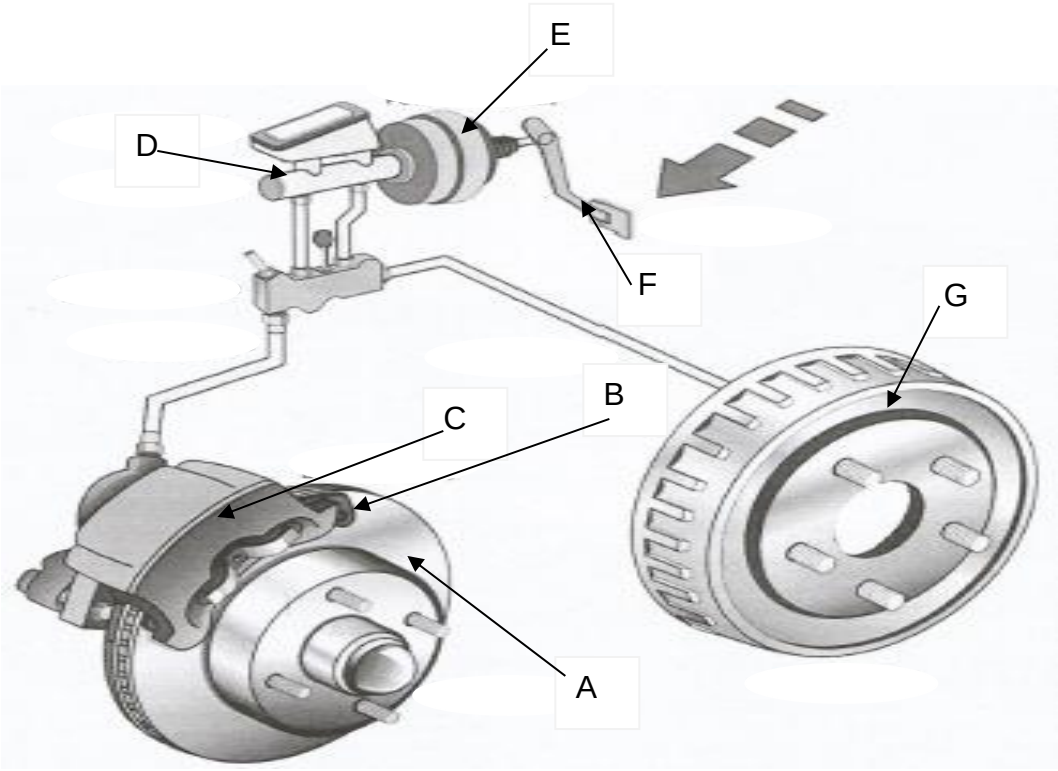

FIGURE 3

6.5.1 Briefly explain ONE purpose of components E and D. (2)

6.5.2 Name the parts labelled A–G. (7)

[25]

TOTAL: 100