higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T370(E)M25)T
APRIL EXAMINATION

NATIONAL CERTIFICATE

DIESEL TRADE THEORY N2

(11040192)

25 March 2014 (Y-Paper)
13:00–16:00

This question paper consists of 8 pages.

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. Write neatly and legibly.

QUESTION 1

1.1 FIGURE 1 shows a synchronising unit that is used in a four speed gearbox.

Name the components labelled (A-D) and write the answers in the ANSWER BOOK.

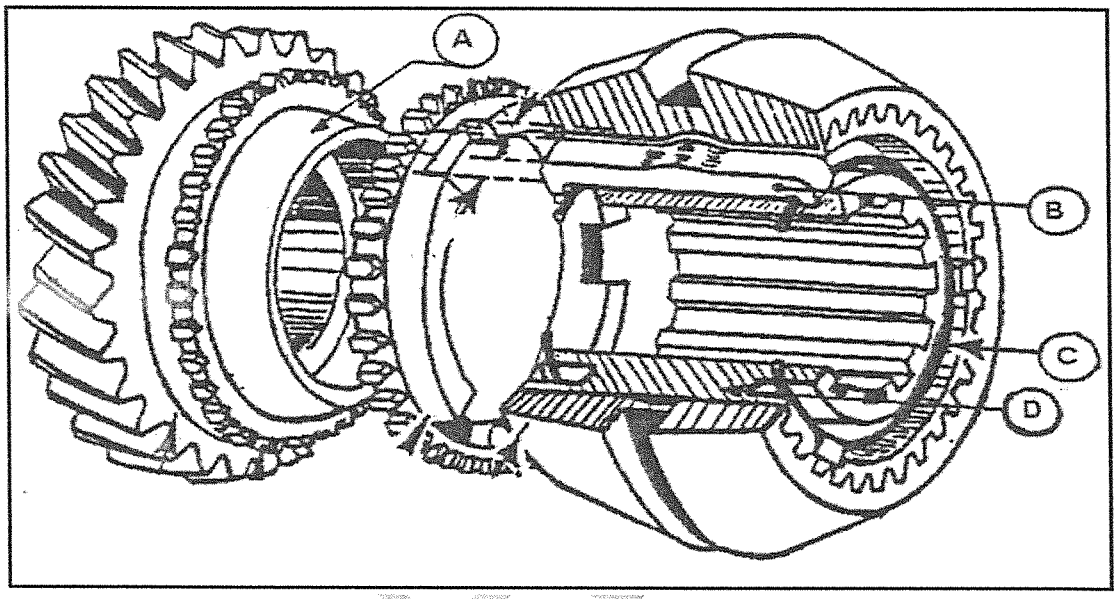

FIGURE 1

(4)

1.2 Explain the operation of the synchronising unit when gear changing occurs from the 3rd to the 4th gear.

(6)
[10]

QUESTION 2

2.1 FIGURE 2 shows a final drive and differential assembly system that is used on trucks. Name the components labelled (A-E) and write the answers in the ANSWER BOOK.

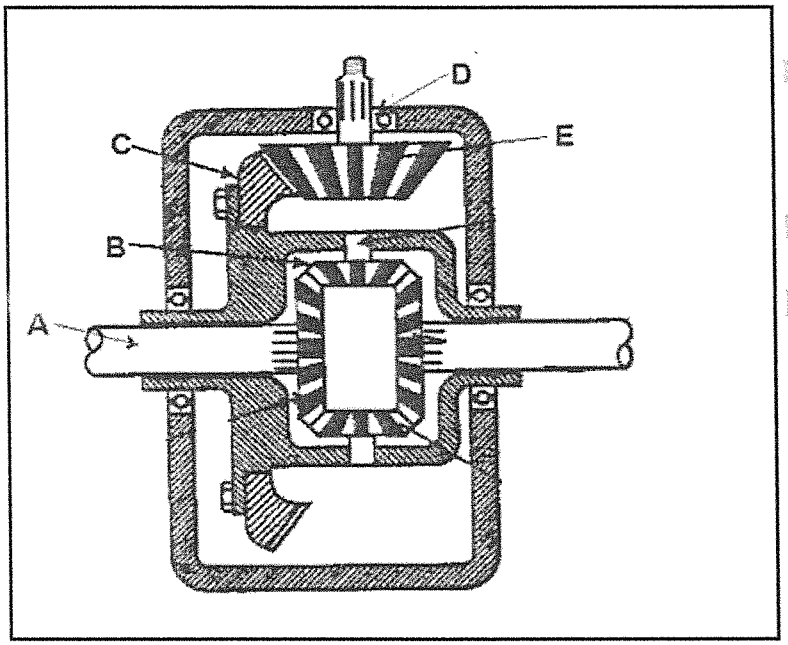

FIGURE 2 (5)

2.2 Explain the power flow through the final drive and differential system when the vehicle moves straight forward. (4)

2.3 State ONE purpose of the thrust washers that are fitted between the spider gears and the differential carrier. (1)

2.4 Name TWO components that form the final drive. (2)

2.5 State TWO functions of the final drive. (2)

2.6 Name the FOUR components that make up the differential. (4)

2.7 Give TWO functions of the differential. (2)
[20]

QUESTION 3

3.1 FIGURE 3 below here, shows a spring blade pack.

Name the items labelled (A-E) and write the answers in the ANSWER BOOK.

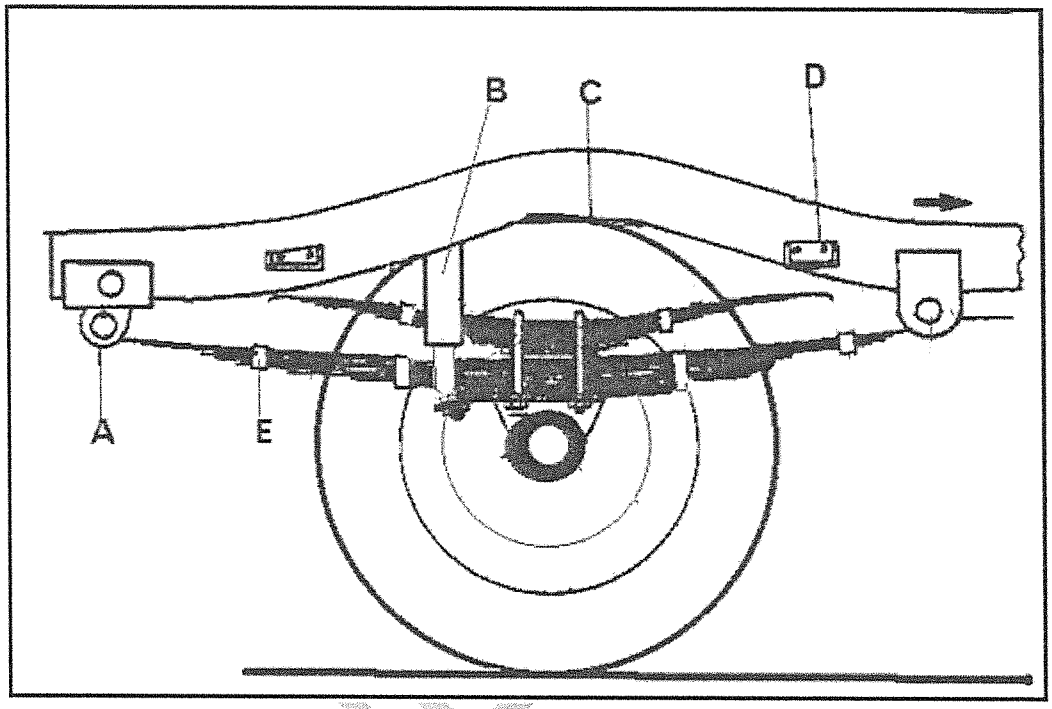

FIGURE 3 (5)

3.2 Name the type of spring blade pack shown in FIGURE 3. (1)

3.3 What is the function of component B on the spring blade pack? (1)

3.4 What is the function of component E on the spring blade pack? (1)

3.5 State TWO functions of a centre bolt on a spring blade pack. (2)

3.6 Draw a neat sketch of a TWO-piece divided drive shaft that is used on trucks with a long wheel base.

In the sketch, show the following components: gearbox housing with gear lever; centre bearing; front and rear propshaft with universal joints. (5)

3.7 State TWO reasons why manufacturers find it necessary to use split-type drive shafts on trucks with a long axle system. (2)

3.8 Name TWO inspections that will show a faulty shock absorber on heavy duty vehicles. (2)

3.9 State ONE advantage of a torsion bar suspension. (1)

[20]

QUESTION 4

4.1 Draw a neat sketch of the Ackerman's principle and indicate the Ackerman's angle; track rod; radius arm angle; vehicle center line; front and rear axles. (5)

4.2 FIGURE 4 shows the front wheel of a truck in contact with the road surface.

Name the items labelled (A-D) and write the answers in the ANSWER BOOK.

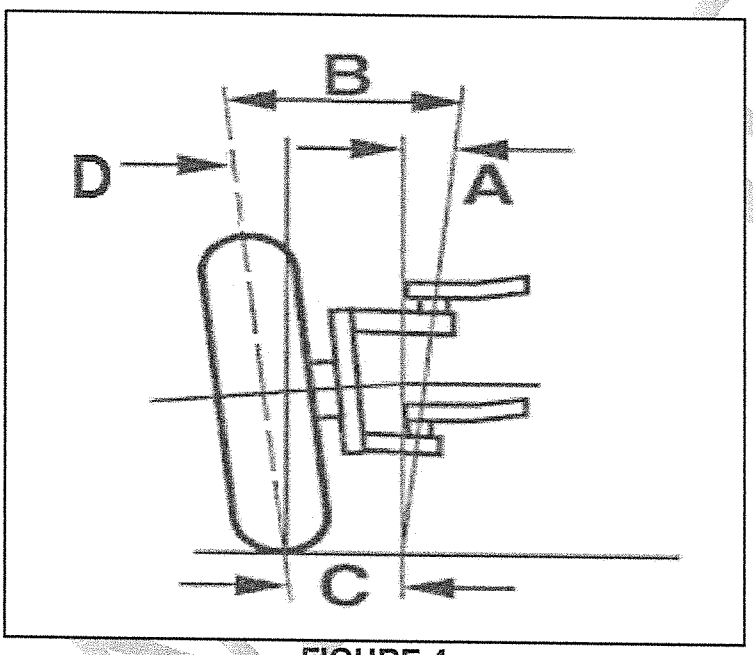

FIGURE 4 (4)

4.3 Name the type of front axle as shown in FIGURE 4. (1)

4.4 Explain briefly how the castor angle can be altered on the type of front axle shown in FIGURE 4. (2)

4.5 State how the camber angle can be altered on the type of front axle shown in FIGURE 4. (1)

4.6 Name THREE types of steering boxes used on heavy duty trucks. (3)

4.7 Name TWO types of lubricants that are used in steering boxes. (2)

4.8 Give the names for TWO different types of valves used in shock absorbers. (2)

[20]

QUESTION 5

5.1 Draw a neat labelled sketch of a vacuum-operated brake booster in the rest position. Show also the direction of air flow, the brake pedal, diaphragm, the diaphragm return spring and the master cylinder activating pin. (6)

5.2 What is the purpose of the brake-load sensor valve? (1)

5.3 Where is the brake-load sensor valve situated? (1)

5.4 State TWO reasons why it is necessary to change the brake fluid on hydraulic-operated braking systems? (2)
[10]

QUESTION 6

6.1 FIGURE 5 shows an air cleaner unit.

Name the components labelled (A—E) and write the answers in your ANSWER BOOK.

HINT: 'C'- Describe the quality of the air.

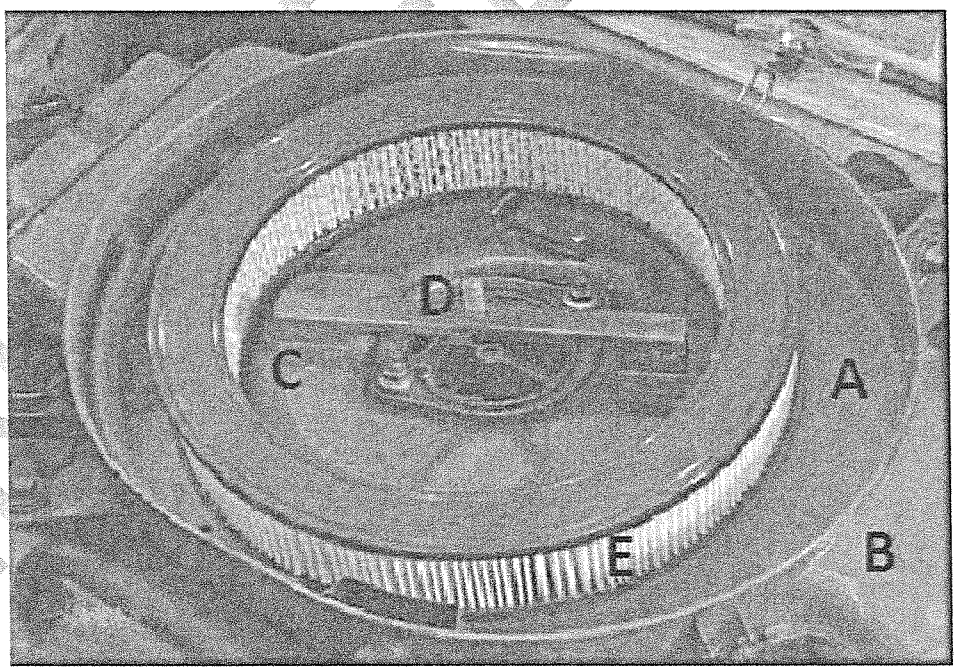

FIGURE 5 (5)

6.2 State the purpose of component 'D' as shown in the sketch. (1)

6.3 Making use of the component names (A-E) as given in FIGURE 5, explain how clean air flows to the carburettor. (3)

6.4 State TWO functions of an air filter. (2)

6.5 An air filter is a consumable item that has to be replaced.

State THREE reasons why an air filter would need to be replaced. (3)

6.6 Explain how the turbulence of air during the intake stroke of a diesel engine, can be increased. (2)

6.7 Name another type of filter found in a diesel engine. (1)

6.8 List THREE negative effects of NOT using an air filter in a vehicle. (3)

[20]

TOTAL: 100

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MARKING GUIDELINE

NATIONAL CERTIFICATE

APRIL EXAMINATION

DIESEL TRADE THEORY N2

25 MARCH 2014

This marking guideline consists of 7 pages.

QUESTION 1

1.1 Synchronizing unit

A = Taper face of gear✓
B = Locking plate ✓
C = Return spring✓
D = Hub ✓ (4)

1.2 The synchroniser unit is splined on to the main shaft whilst the gears rotate freely on the main shaft.✓ When the gear lever is moving in the direction of the chosen gear the gearlever moves the chosen selector shaft.✓ The selector fork is fixed on the selector shaft and fits in a groove of the sliding sleeve. When the gear lever moves the fork, the fork will move the sliding sleeve in the direction of the chosen gear. The spring loaded locking plates which fit in dents of the sliding sleeve move with the sliding sleeve as well as rotate with the sinchro hub. ✓

The synchronising ring have slots which connect the sinchronizing to the locking plates which cause the sinchro rings to rotate at the same velocity as the sinchro unit.✓ When the sliding sleeve move the locking plates move with it, pressurizing the sinchro ring to move axially with the sliding sleeve. The taper face of the sinchro ring exerting pressure on the taper face of the gear braking or accelerating the gear which are loose on the shaft to move at the same speed as the sinchro unit.✓At this stage the sliding sleeve will slip over the teeth of the sinchro ring as well as the dogteeth of the gear to engage the gear with the sinchronizer unit for drive to the wheels.✓ (6)
[10]

QUESTION 2

2.1 Final drive and differential assembly:

A = Left hand side shaft ✓
B = Planetary gears✓
C = Crown wheel ✓
D = Pinion bearing ✓
E = Pinion gear ✓ (5)

2.2 The pinion drives the crown wheel and carrier that is bolted together.✓ The carrier rotates the differential cross pin in a swirling action, the planetary gears fits on a cross pin and thus can turn on the cross pin. ✓
The planetary gears mesh with the sun gears. When moving straight ahead, the pinion drives the crown wheel, carrier and cross pin while the cross pin tumbles the planetary gears thus driving the sun gears.✓ The planetary gears and sun gears rotate the side shafts at equal revolutions in the same direction.✓

(4)

2.3 Function of the thrust washers in a final drive and differential assembly:

To provide a pre-determined end play on the sun gears and planetary gears in order to ensure noiseless operation of the spider gear system when going around corners.✓ (1)

2.4 Pinion✓
Crown wheel✓ (2)

2.5 To change the direction of the drive at 90° from the pinion to the driving wheels.✓
To supply a constant gear reduction from the gearbox to the rear wheels.✓
(2)

2.6 Planetary gears✓
Sun gears✓
Planetary gear housing✓
Cross pin✓ (4)

2.7 To enable the side shafts to move at different velocities while driving the pinion.✓
To provide a constant distribution of energy between the wheels while moving straight or while cornering.✓ (2)
[20]

QUESTION 3

3.1 Spring blade pack

A = Helper spring ✓
B = Shock absorber ✓
C = Chassis✓
D = Bracket or helper spring ✓
E = Movable shackle✓ (5)

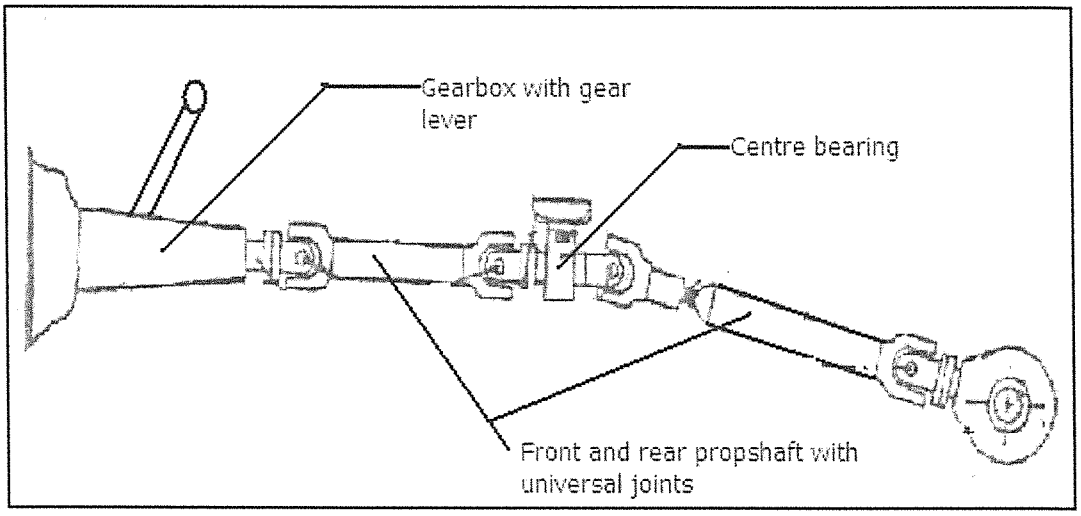
3.2 Semi elliptic spring blade with helper✓ (1)

3.3 Keep the wheel on the road whilst the vehicle is moving.✓ (1)

3.4 To swivel forward and backwards to allow the final drive housing to move up and down while the vehicle is moving✓ (1)

3.5 To keep the final drive housing in position with the chassis of the vehicle.✓
To keep the spring blades in position.✓ (2)

3.6 Split type drive system:



(5)

3.7 Long drive shafts cannot maintain the same torsional circumferential stress per length as with a shorter drive shaft and may carry the same material and circumference.✓
Long drive shafts at high revolutions tend to vibrate due to circumferential velocity for the same circumference and material when compared with shorter drive shafts.✓ (2)

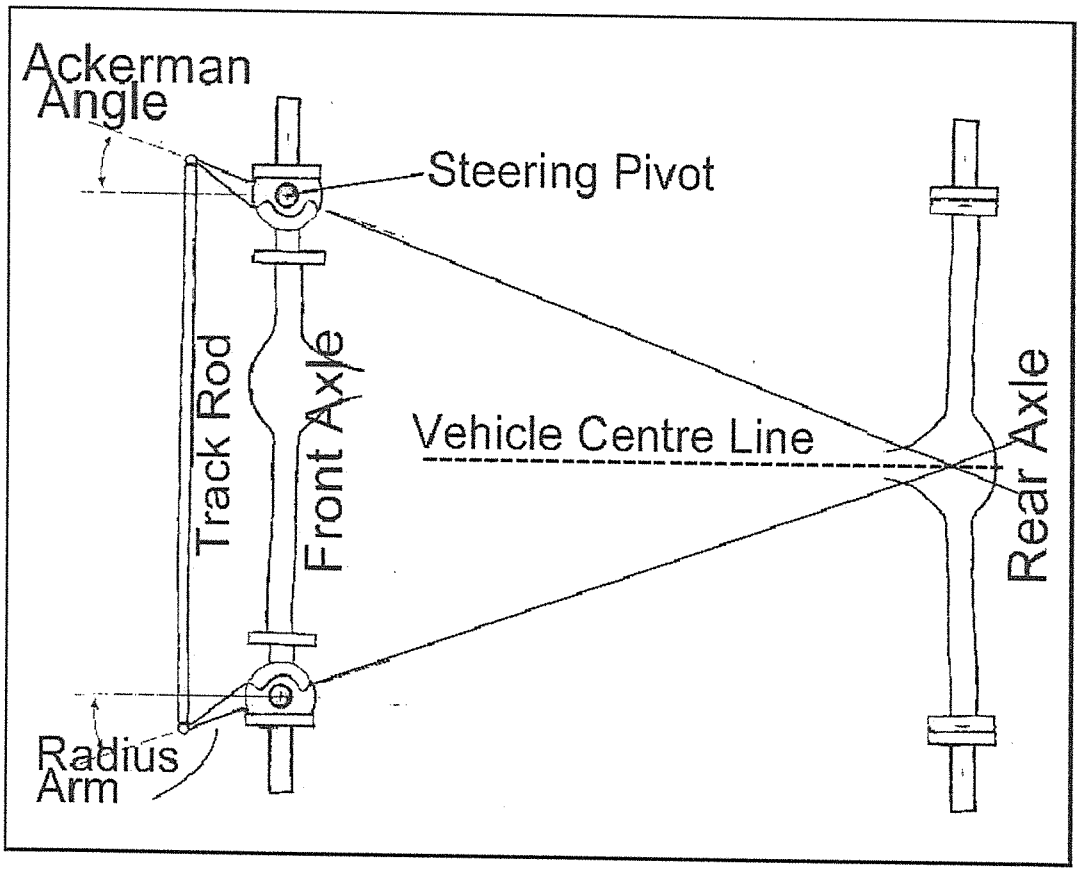
3.8 Visual checks to see if the shock absorber is leaking oil ✓and Inspect to see if the shock absorber is not bend✓ /Score marks on shaft. (2)

3.9 It is adjustable. (1)

[20]

QUESTION 4

4.1 Ackerman angle:



(5)

4.2 A = Positive camber angle✓
B = Included angle✓
C = Kingpin inclination angle✓
D = Centre line✓

(4)

4.3 Reverse Elliot.

(1)

4.4 By Using a taper wedge✓ between the axle and the spring blades.✓

(2)

4.5 Bend the axle✓.

(1)

4.6 4.6.1 Recirculating ball type steering box✓
4.6.2 Worm and hour glass roller type hourglass✓
4.6.3 Worm and nut type✓

(3)

4.7 4.7.1 Oil✓
4.7.2 Grease✓

(2)

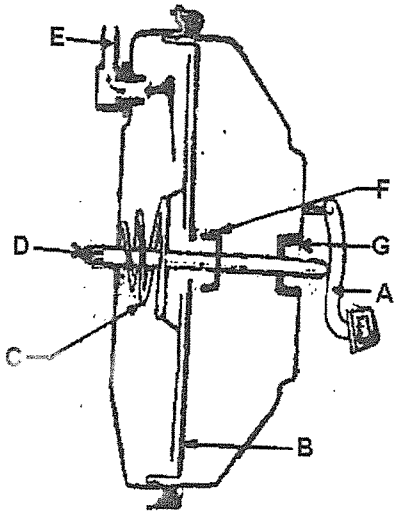
4.8 4.8.1 Compression valves✓
4.8.2 Foot valves✓

(2)

[20]

QUESTION 5

5.1 Simple Vacuum brake booster



A = Brake pedal✓
B = Diaphragm✓
C = Diaphragm return spring✓
D = Master cylinder activating pin✓
E=Air flow ✓

(Correctness = ✓) (6)

5.2 It increases the braking force at the rear brakes when the brakes are applied with a load on the vehicle.✓ (1)

5.3 At the rear of the vehicle.✓ (1)

5.4 Water is absorbed by the brake fluid and can cause rust in the brake system.✓
Sludge forms in the brake fluid and residue can cause blockages or lessen the amount of brake fluid passing through the system.✓ (2)
[10]

QUESTION 6

6.1 A= Filter Housing✓
B= Air inlet arm✓
C= Clean Air✓
D= Bolt\Securing Bolt✓
E= Air filter element.✓ (5)

6.2 The air filter housing cover is secured on the bolt.✓ (1)

6.3 Air flows through "B" the air inlet unit✓ and enters" A" the filter housing, the air then flows through "E" the air filter element✓ and into the carburettor.✓ (3)

6.4 Reduces noise✓ and prevents dirty air from entering the engine.✓ (2)

6.5 The vehicle becomes heavy on fuel.✓
When it is recommended by the manufacturer.✓
If there is damage to the element.✓ (3)

6.6 The turbulence of air during the intake stroke of a diesel engine can be increased by using a masked intake valve and the intake manifold must be designed to allow increased turbulence✓✓. (2)

6.7 Fuel Filter\Diesel Filter✓
Oil Filter housing cover is secured on the bolt.✓
ANY ONE (1)

6.8 Increase fuel consumption.✓
Damage to engine.✓
Noisy engine.✓ (3)
(ANY OTHER RELEVANT ANSWER) **[20]**

TOTAL: 100