



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE
AUGUST EXAMINATION
DIESEL TRADE THEORY N2

22 JULY 2014

This marking guideline consists of ⁷/₈ pages.

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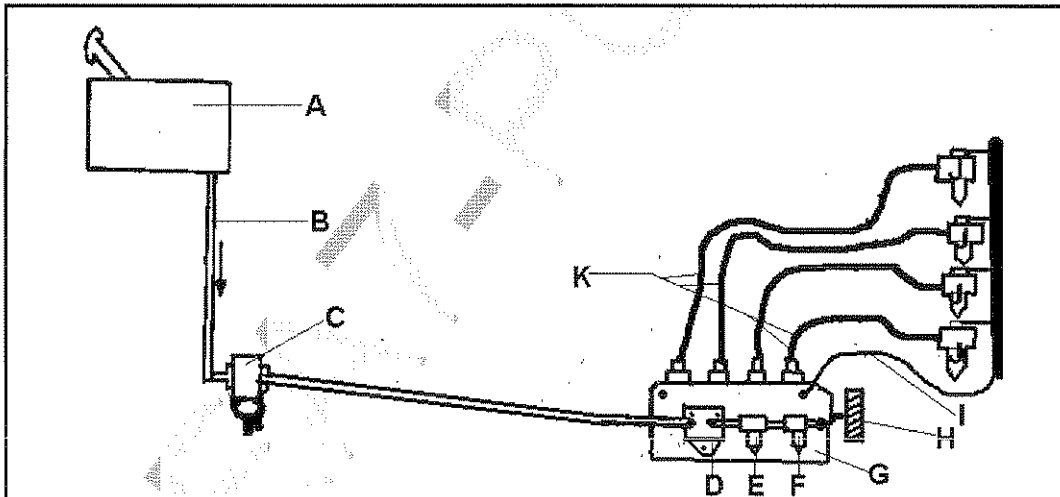
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QUESTION 1

- 1.1 1.1.1 Advantages of a direct injection engine
- Easier starting because less heat is lost during compression stroke✓
 - Glow plugs are not required for cold starting✓
 - Increase thermal efficiency results in relatively lower fuel consumption✓
 - Simple in construction✓ (3)

- 1.1.2 Disadvantages of direct injection engine
- Due to increase mean effective pressure, combustion knock may occur more frequently and be more pronounced.✓
 - Increase injection pressure places more stress on the injector pump.✓
 - Higher cetane value fuel must be used to reduce knock✓ (3)

1.2



- A = Fuel tank✓
 - B = Fuel supply pipe✓
 - C = Water trap filter✓
 - D = Low pressure fuel lift pump✓
 - E = Secondary filter✓
 - F = Primary filter✓
 - G = High pressure fuel injection pump✓
 - H = Fuel pump timing gear✓
 - I = Leak of pipes✓
 - J = Injectors✓
 - K = High pressure fuel lines✓
- (Line sketch is also acceptable)

(8)

1 mark per label (any 5 labels + sketch = 3)

- 1.3
- Paper maché ✓
 - Porous porcelain ✓
 - Metal plates tightened to each other or wire mesh ✓
 - Cotton cloth ✓
- (3)
- 1.4
- To conduct heat away from the injector tip ✓
 - To form a gastight seal between the injector and the cylinder head ✓
 - To form a spacer ✓
- (any two)
(2)

[20]

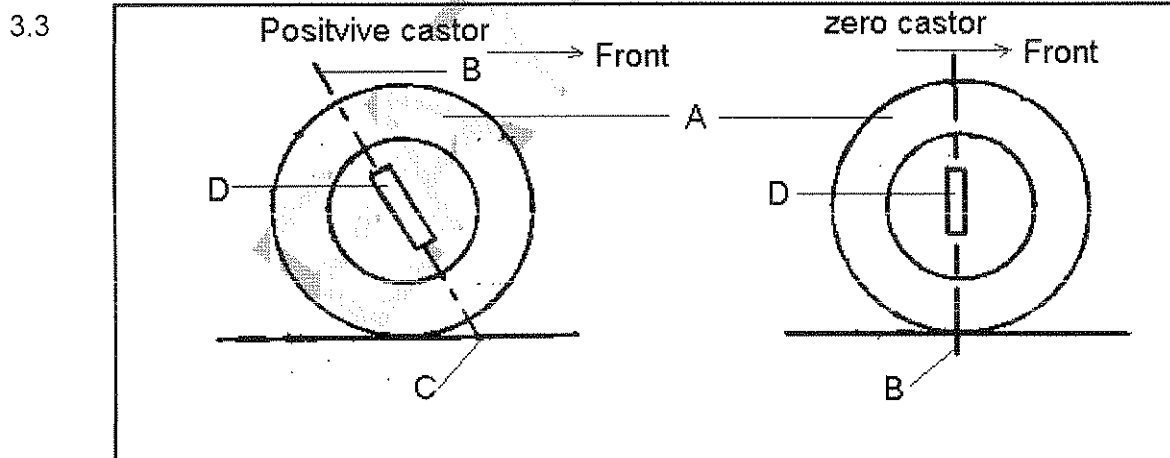
QUESTION 2

- 2.1 Constant loading synchronising unit. ✓ (1)
- 2.2
- A = Fourth gear /input gear/ top gear ✓
 - B = Dogteeth /external teeth ✓
 - C = Synchro sleeve ✓
 - D = Synchro hub ✓
 - E = Selector fork ✓
 - F = Detent ball ✓
 - G = Detent spring ✓
 - H = Third gear ✓
- (8)
- 2.3
- When the gear lever moves the selector shaft the shaft moves the selector fork ✓ and the fork which fits in the outer groove of the sliding sleeve moves the sliding sleeve in the direction of the chosen gear ✓. Due to the fact that the balls is preventing the sliding sleeve to slide axially in grooves the sliding hub moves with the sliding sleeve until the taper end of the sliding hub came in contact ✓ with the taper face of the gear which cause friction between the sliding hub and the gear, by increasing the pressure on the gear lever the pressure between the sliding hub and the gear will increase resulting in increasing ✓ the revolutions of the gear to be selected. When the revolutions of the gear and the sleeve became the same the sleeve will slip over the dogteeth of the gear and the gear is selected. ✓
- (5)
- 2.4
- Obtains a gear reduction to enable the vehicle to pull away from rest. ✓
 - Enables the vehicle to move at different speeds ✓
 - Consists of a neutral gear that enables the engine and gearbox to disconnect from each other. ✓
 - Enables the vehicle to move backward while the engine is rotating. ✓
- (4)

- 2.5 2.5.1 Interlocking mechanism: Prevents two gears to be selected simultaneously.√
- 2.5.2 Locking mechanism: Prevents jumping out of gear on a gearbox.√
(2 x 1) (2)
[20]

QUESTION 3

- 3.1 Safety requirements needed for a steering mechanism:
- Light and easy to control the vehicle√
 - Absorb shocks and vibrations from uneven road surfaces√
 - Self centring, Bring wheels back to straight ahead position after turn√
 - Suspension and braking must have little effect on good steering system√
- (4)
- 3.2
- To ensure that the steering wheel turns lightly and with the same effort in both directions.
 - To prevent the steering wheel from picking up road shocks on uneven ground surfaces.
- (2)



A = Wheel √
 B = Centre line through kingpin √
 C = Centre line at front of centre of wheel to show positive castor√
 D = Kingpin √
 (labels 1 mark each.)

(sketch 4 marks correctness) (8)

- 3.4
- Worm and sector✓
 - Worm and nut with recirculating balls✓
 - Cam and roller✓
 - Cam and lever✓
 - Worm and worm gear/rack and pinion✓
- (Any 4 × 1) (4)
- 3.5
- Static balancing✓
 - Dynamic balancing✓
- (2 × 1) (2)

QUESTION 4

- 4.1
- A = Side shaft left hand side✓
 - B = Sun gear /side gear✓
 - C = Planetary gear cross pin ✓
 - D = differential carrier bearings✓
 - E = Crown wheel carrier bolts✓
 - F = Crown wheel ✓
 - G = Pinion ✓
 - H = Thrust washers ✓
- (8)
- 4.2
- 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, thus the planetary gears and sun gears will not rotate✓ into each other but will rotate the side shafts at equal revolutions in the same direction.✓
- (4)
- 4.3
- 4.3.1 Advantages of semi-floating rear axles
- Design is simple.✓
 - Manufacturing cost is comparatively low.✓
 - Assembly has comparatively low mass. ✓
- (Any 2)
- Disadvantages of a semi floating rear axle
- If side shaft breaks between bearing and hub wheel will fall off.✓
 - If side shaft breaks between bearing and differential, wheel will tilt and damage brake linings or shoes.✓
 - To remove or replace a side shaft, vehicle must be raised and wheel removed. ✓
- (Any 2)
- 4.3.2 Advantages of a fully floating rear axle
- The bearings are set at a fair distance apart from each other, thus the load is distributed over a large area. Enables hub to carry a large mass.✓
- (8)

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- The axle shaft carries no mass. ✓
 - Axle shaft can be removed without raising the vehicle and removing the wheel. ✓
 - If the axle is broken the vehicle can still be towed on all four wheels. ✓
- (Any 2)

Disadvantages of a fully floating rear axle

- Mass more than semi floating rear axle. ✓
 - Design is complicated. ✓
 - Cost to manufacture is higher. ✓
- (Any 2)

(8)

[20]**QUESTION 5**

5.1

Connect a bleeding pipe to bleeding nipple ✓ furthest from master cylinder, with free end of pipe immersed in brake fluid in jar. The brake pedal is repeatedly applied and released ✓ slowly until no air bubbles is discharged ✓ from bleeding pipe. The bleeding nipple is opened when the brake pedal is pressed down ✓ and closed when the brake pedal is kept applied. Reservoir to be kept full at all times. ✓ This procedure is repeated until no air bubbles are discharge through the bleeding pipe. ✓

(6)

5.2.1 Excessive brake pedal free play

- Worn pedal bushes ✓
 - Excessive free play between brake pedal and pushrod, or pushrod and piston in brake master cylinder ✓
 - Bad pedal return spring ✓
- (3)

5.2.2 Spongy brake pedal

- Air in the brake system ✓
 - Under sized brake shoes fitted ✓
 - Brake drum is cracked ✓
 - Brake drum or brake shoes may be oval ✓
 - Rubber hoses ballooning under pressure ✓
- (Any 3) (3)

5.2.3 Dragging Brakes

- Too tight adjusted hand brake ✓
- Relief port blocked ✓
- Brake fluid contamination ✓
- Vent hole blocked on reservoir cap ✓
- Brake pads fitted incorrectly ✓

(Any 3)

(3)

- 5.3 Fixed calliper✓
Floating calliper✓ (2)
- 5.4
- Must be resistant to freezing✓
 - Must be resistant to evaporation✓
 - Have a high boiling point✓
 - Be resistant to clogging✓
 - Not have a detrimental effect on rubbers✓
 - Must lubricate moving parts✓
 - Have low viscosity✓
 - Be hygroscopic ✓

(Any 3) (3)
[20]

TOTAL: 100

EXTRA PAGES