



**higher education
& training**

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

DIESEL TRADE THEORY N3

7 AUGUST 2019

This marking guideline consists of 6 pages.

QUESTION 1

1.1
$$Cr = \frac{Vs + Vc}{Vc}$$

$$Vs = Vc [Cr - 1]$$

$$= 180 [15 - 1]$$

$$= 2\,520 \text{ cm}^3$$

$$Vs = \frac{\pi D^2 \times Ls}{4}$$

$$Ls = \frac{4 \times Vs}{\pi D^2}$$

$$= \frac{4 \times 2\,520}{\pi \times 9.8^2}$$

$$= 33,719 \text{ cm} \quad (7)$$

1.2
$$\eta = 1 - \left[\frac{1}{R} \right]^{0.4}$$

$$= 1 - \left[\frac{1}{15} \right]^{0.4}$$

$$= 0.66$$

$$= 66\% \quad (3)$$

- 1.3
- Improve air cleaner (filter) fitted to the engine
 - Rebore cylinder and fit oversize pistons
 - Replace the intake manifold with a free-flow manifold
 - Fit more or larger intake valves
 - Fit a super charger or turbo charger
 - Smooth the inside of the intake manifold
 - Improve valve timing to allow the intake valve to stay open longer
- (Any 5 × 1) (5)

- 1.4 Advantages
- Burning gasses expand to a greater volume during power stroke and a greater pressure is exerted on the piston.
 - Higher compression pressure provides improved heat energy.
- (2)

Disadvantages

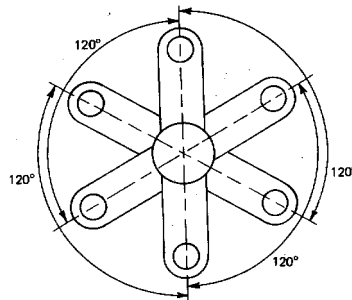
- An increase in pressure causes detonation or knocking.
 - Knocking may lead to damaged parts.
 - New improved fuels must be used to prevent knocking.
 - Carbon forms in the cylinder which decreases the clearance volume.
- (Any 3 × 1) (3)
- [20]**

QUESTION 2

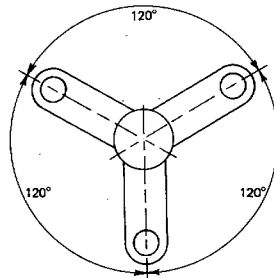
- 2.1 2.1.1 A – Flywheel (Inertia ring)
 B – Crankshaft pulley
 C – Casing
 E – Crankshaft
 F – Crankshaft nut
 G – Silicon (Fluid layer about flywheel) (5)

- 2.1.2 When the crankshaft accelerates the inertia of the flywheel retards the crankshaft. The flywheel slips in the opposite direction on the silicon to retard the crankshaft. When the crankshaft retards, the flywheel, due to its inertia, tends to run on and prevents the crankshaft from a sudden retardation. Again the flywheel slips on silicon to the point where velocities correspond. (5)

- 2.1 2.2.1

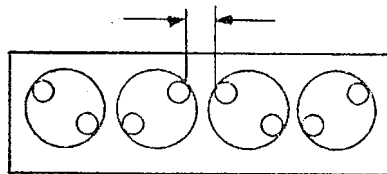


- 2.2.2



(2 × 3) (6)

- 2.3



(2)

- 2.4
- Larger valves may be used.
 - The layout improves cooling.
 - Improved volumetric efficiency is obtained.
 - Shorter cylinder head is possible.

(Any 2 × 1) (2)

[20]

QUESTION 3

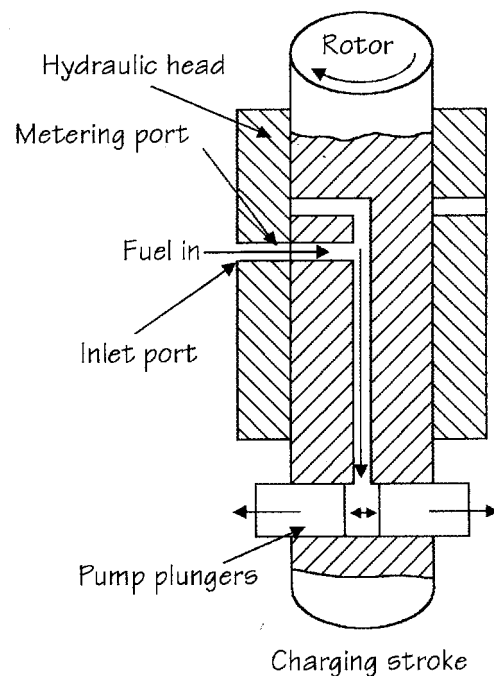
- 3.1
- The fins of the torque converter are helical.
 - The torque converter has a stator.
 - The torque converter has a one-way clutch.
 - The torque converter is provided with oil directly from the gearbox pump.
 - The fluid flywheel is filled through a filler plug. (Any 4 × 1) (4)
- 3.2
- 3.2.1
- A – Crown wheel
 - B – Sun gear
 - C – Planetary gear
 - D – Planetary gear shaft
 - E – Clutch plate (5)
- 3.2.2
- The driving wheel moving across the slippery surface gives the least resistance to its sun gear compared to the wheel on the solid surface. The differential slides in the slots in the carrier by means of the planetary shafts toward the slipping wheel. The sun gear on the slipping wheel side is connected to the carrier by means of the clutch system. The drive from the crown wheel is distributed evenly to both wheels due to the locked differential. (6)
- 3.3
- Blocked oil filter
 - Low oil level
 - Oil leakage in system
 - Air in hydraulic system
 - Faulty pump
 - Faulty shuttle valve
 - Faulty hydraulic cylinder
 - Pinched pipes to cylinder
 - Flat front tyres
 - Seized steering joints (Any 5 × 1) (5)
- [20]**

QUESTION 4

- 4.1 4.1.1 A – Pump cam shaft
 B – Fly weights
 C – Governor spring
 D – Accelerator lever
 E – Rack
 F – Sliding hub (6)

- 4.1.2 The engine loses speed under load. As soon as the engine loses speed the centrifugal force of the fly weights drops. The governor spring forces the sliding hub to the right which forces the rack to the left. More fuel is provided to the engine which automatically leads to higher engine revs. (6)

4.2

(8)
[20]

QUESTION 5

5.1	5.1.1	I or J		
	5.1.2	G		
	5.1.3	C		
	5.1.4	F		
	5.1.5	F		
			(5 × 1)	(5)
5.2	• Mechanical aptitude • Inquiring mind • Able to work in a team • Academically well qualified • Prepared to further technical studies • Healthy, no disabilities • Stable mentality and disposition			
			(Any 5 × 1)	(5)
5.3	• Original given to customer • First copy completed by mechanic • Second copy given to the parts section • Third copy given to the costing department • Forth copy filed by receptionist			
				(5)
5.4	Advantages: • Equipment installed also used for diagnostic and quality control • Faults generally passed on to the workshop thus increasing profit on labour and parts • Attracts customers who appreciate checks for safety and efficiency • Flexibility for partial inspections if of a bay-type centre • Useful for checking second-hand vehicles prior to repair and selling			
			(Any THREE)	
	Disadvantages: • Costly investment • Trained mechanics needed to use equipment. • Space used which otherwise could be used for repair bays.			
			(Any TWO)	(5)
				[20]
			TOTAL:	100