

7165 2
Diesel Engine Technology



CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD

Technical and Vocational Education Examination

JUNE XXXX

ADVANCED LEVEL

Specialty Name (Specialty Code)	
Subject Title	Diesel Engine Technology
Paper No.	2
Subject Code No.	7165

Three hours

INSTRUCTIONS TO CANDIDATES

This paper is made up of EIGHT (8) questions; answer any FIVE, choosing THREE (3) from section A and TWO (2) from section B. All questions carry equal marks.

You are reminded of the necessity for good English and orderly presentation in your answers.

You are advised to read carefully through the question paper, before you begin your answers.

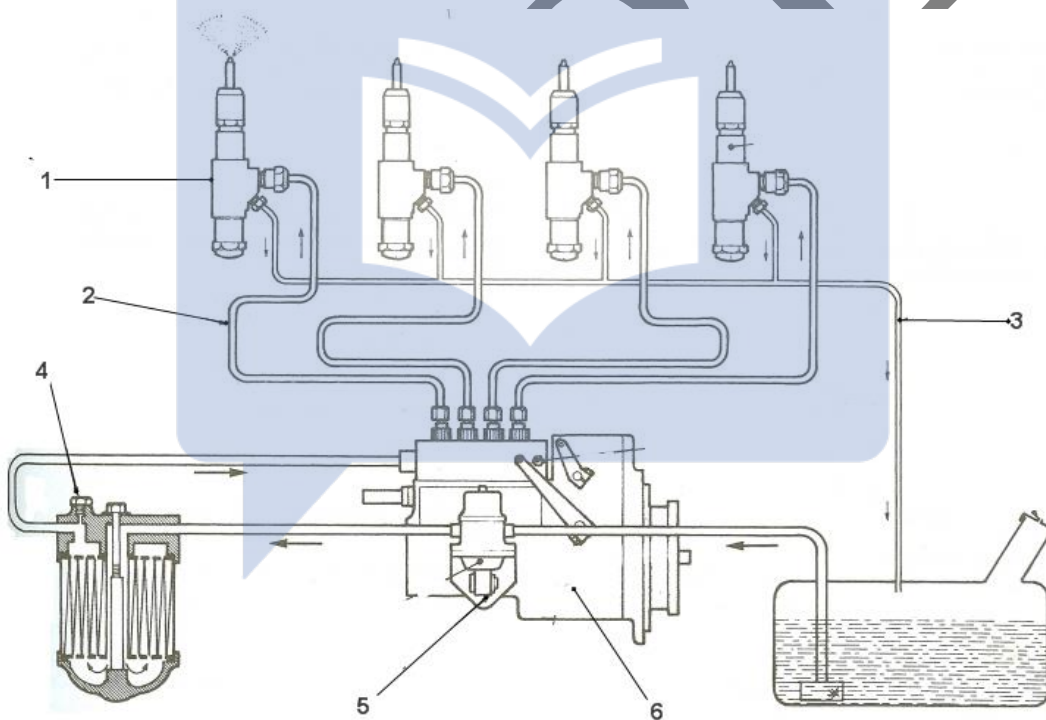
Turn Over

XXXX/7165/2/C

SECTION A**Answer any THREE questions in this section**

1.
 - a. In about three lines maximum, write a short note on carbon monoxide emissions **(3marks)**
 - b. Apart from Carbon Monoxide, name **TWO (02)** pollutants present in combustion products? **(3marks)**
 - c. What is CI engine knock? **(2marks)**
 - d.
 - i. Name the type of lubrication system used on an 8 cylinder V-engine? **(2marks)**
 - ii. Give an advantage and a disadvantage of this type of lubrication. **(3marks)**
 - iii. What type of oil viscosity is used for such an engine and why? **(3marks)**
 - iv. Give **TWO** possible faults that could be observed if the lubricant is not changed within the required mileage. **(4marks)**
- TOTAL (20MARKS)**

2. **Figure 1** shows a diagram of a diesel injection fuel management system.

**Figure 1**

- a. Recopy the table on your answer booklet and give the names and functions of the various parts **(9mark)**

Ref.	Name (0.5 x 6marks)	Function (1 x 6marks)
1		
2		
3		
4		
5		
6		

- b. What is injection system as used in a diesel engine operation? **(2marks)**
- c. What is the difference between direct and indirect injection as used in diesel engine? **(3marks)**
- d. Why is a large pressure difference across the injector nozzle required? **(2marks)**
- e. Why are heavy duty vehicles mostly fitted with more than one filter? **(2marks)**

f. Give **FOUR** products of diesel combustion.

(2marks)

3. a. Specify the name of this device in figure 2 below and its role

(3marks)

b. With reference to **figure 2**, designate part 2,3,4,8 and 9.

(5marks)

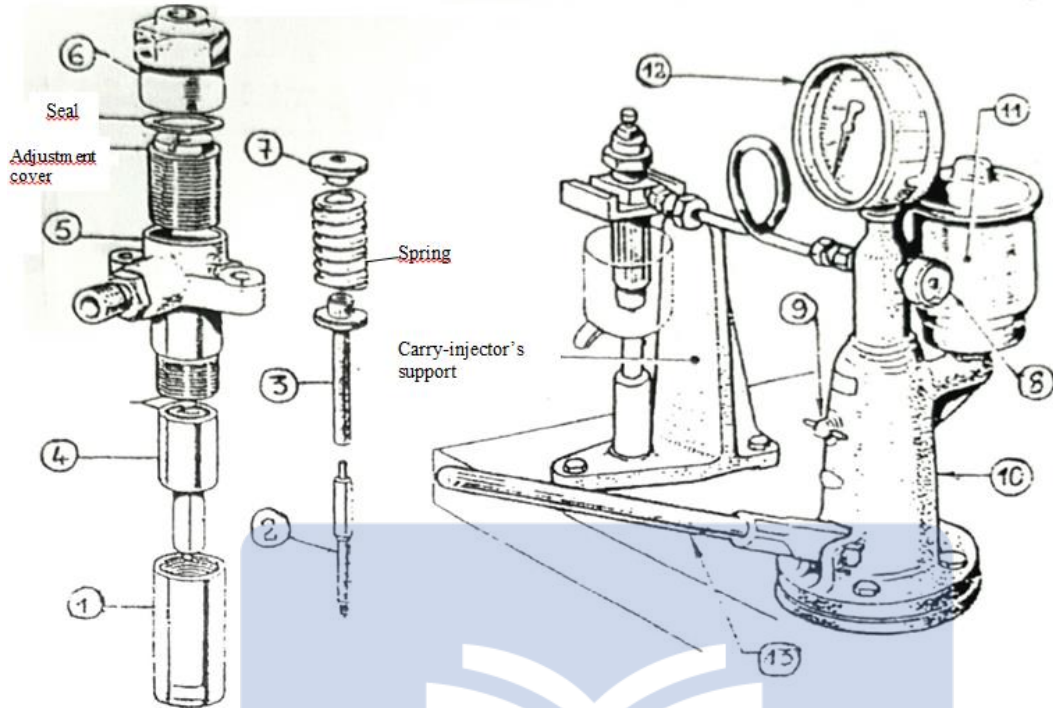


Figure 2

c. State the role of an injector?

(2mark)

d. Enumerate the **TWO** elements on which we intervene to adjust the injector

(2marks)

e. In **TEN (10)** lines maximum, briefly explain a pressure check operation of an injector on a test bench

(4marks)

f. identify **FOUR** types of checks done by the use of this device in **figure 2** above

(4marks)

TOTAL (20MARKS)

4. The **figure 3** below represents the device of direct injection "common rail".

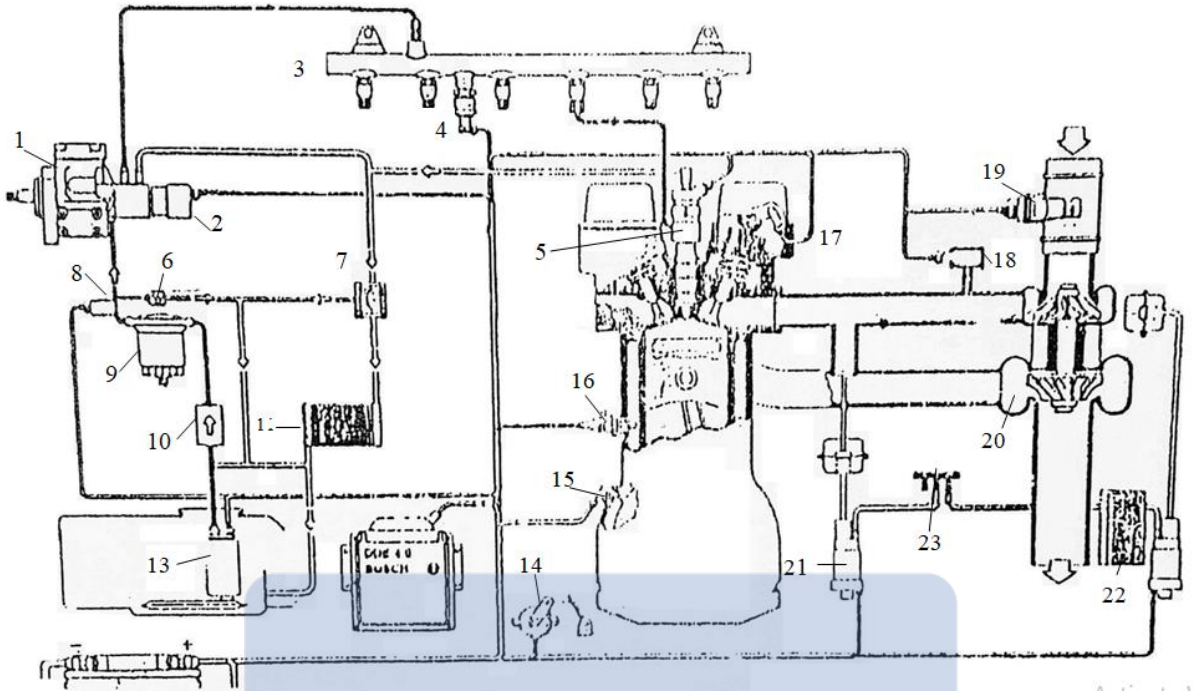


Figure 3

- a. Copy in your booklet and fill the table below in relation to **figure 3**: **(8marks)**

N°	Name of part	N°	Name of part
1		15	
2		16	
3		19	
4		20	

- b. Give the name of the fuel used in this engine: **(1.5mark)**
 c. Quote **TWO** manifestations of the engine when part 5 is defective **(3mark)**
 d. What determines the beginning and the injection's flow in this system? **(1.5mark)**
 e. Discuss on the major changes brought about with the common rail on a diesel engine **(6 marks)**

TOTAL (20MARKS)

5. a. How do modern diesel engines accomplish cold starts without using a glow plug? (3marks)
 b. Cite **TWO** reasons why diesel fuel evaporates slower than gasoline (3marks)
 c. Consider the diagram below (Figure 3).

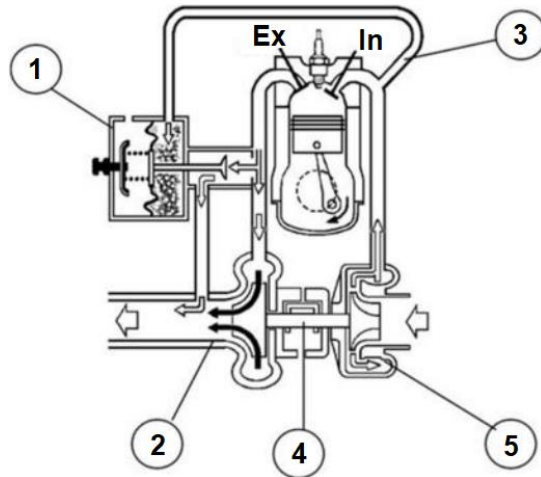


Figure 4

- i. Give the names of the following parts. 1, 2, 3, 4, 5. (2.5marks)
 ii. Why are vehicles equipped with a turbo charger? (4marks)
 d. make a brief comparison between a turbocharged engine and a naturally aspirated engine (4.5marks)
 e. Which engine's efficiency is improved by the use of an intercooler? (3marks)

TOTAL (20MARKS)

SECTION B

Answer any two questions in this section

6. An engine rotating at a speed of 3000 rpm is able to lift a dynamometer load of 72N. Considering that the length of the torque arm is 0.5m:
 a) How is dynamometer mounted to the engine and how is the Brake Power (B_p) reading obtained (4marks)
 b) Determine:
 i. The Engine Torque (C_T) (4marks)
 ii. The Brake Power of (B_p) (4marks)
 c) What is the linear velocity (v) of the crankshaft (2marks)
 d) Considering the piston diameter (d_p) = 100mm and $\alpha = 45^\circ$
 (i) Calculate the length of the Piston Rod (L_p) (3marks)
 (ii) Calculate Pressure (P_p) exerted on the piston during explosion (3marks)

TOTAL (20MARKS)

- 7 a. Explain the difference between heat and temperature (4 marks)
 b. Heat would be transferred to the air:
 i. State what this process is called. (1 mark)
 ii. Is this the lone process practice by heavy duty engine? Justify your answer (4 marks)
 c. Define:
 i. Heat capacity (2 marks)

ii. Specific heat capacity

(2 marks)

- d. A cooling system contains 5 litres of water at a temperature of 16°C . How much heat is required to raise the water temperature to 96°C . (Specific heat capacity of water= 4200J/KgK) (7 marks)

TOTAL (20MARKS)

- 8 a. State the Charles's law and give its relation to volume, pressure and temperature (4 marks)
 b. Gas in the cylinder has a volume of 60 cm^3 at 27°C . What is the volume of the gas at 77° (6 marks)
 c. State the Boyle's law and give it relations to volume, pressure and temperature. (4 marks)
 d. An engine cylinder contains 480 cm^3 of air at an absolute pressure of 1 bar (199 KN/m^2). Assuming the temperature is kept constant, what will be the absolute pressure when the volume is reduced to 60 cm^3 ? (6 marks)

TOTAL (20MARKS)