Hydraulics and Chassis Systems 2
7175

CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD

Technical and Vocational Education Examination

JUNE XXXX **ADVANCED LEVEL**

Specialty Name (Specialty Code)	
Subject Title	**Hydraulics and Chassis Systems**
Paper No.	**2**
Subject Code No.	**7175**

DURATION: 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.

SECTION A: Hydraulics and Chassis Technology

1. The Figure 1 below representing the air conditioning system.

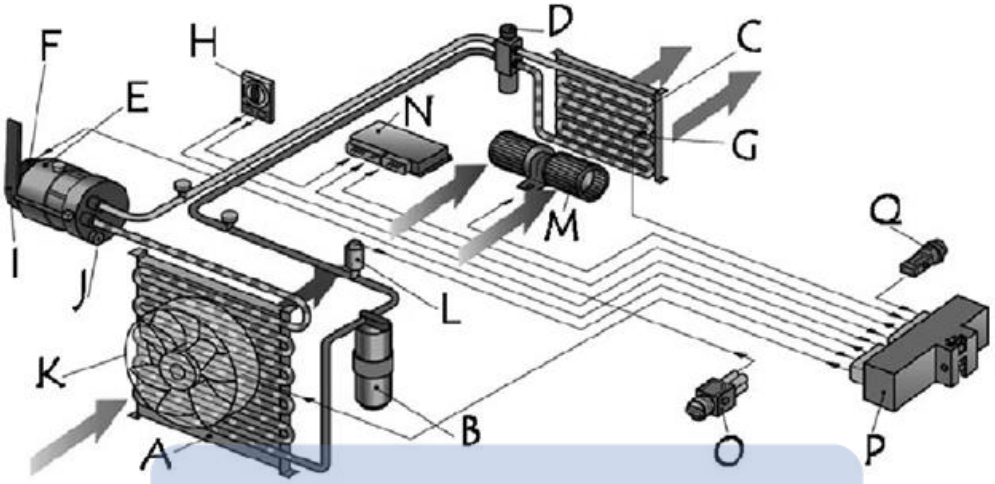

Figure 1

a) Identify part A, B, C, D, E and F of the **figure 1** **(6 marks)**

b) Re-copy the **Table 1** below and write the type of pressure and temperature prevailing in the portions of the circuit of Figure 1 while specifying the physical state of each of the portions **(7marks)**

Portion	Pressure **(0.5x 6marks)**	Temperature **(0.5x6marks)**	Physical state **(0.5x6marks)**
E-A			
A-B			
B-D			
D-C			
C-D			
E-D			

Table: 1

NB: HP=High Pressure; LP=Low Pressure; HT=High Temperature; LT=Low Temperature

c) Propose **TWO (02)** maintenance procedures to frequently carry out. **(2marks)**

d) Discuss how the air conditioning system removes moisture from the air. **(3marks)**

e) List **TWO (02)** methods used to prevent the evaporator from becoming too cold and freezing. **(2marks)**

TOTAL (20MARKS)

2. The **figure 2** below represents a torque converter.

a) Define **"**Torque converter" **(2marks)**

b) Reproduce and complete the following table in your answer booklet **(6 marks)**

N°	Name	N°	Name
1	Engine crankshaft	5	
2		6	
3		7	Input shaft
4		8	

c) i) Why certain fluid couplings use a cutting clutch to transfer torque? **(4 marks)**

ii) Which type of transmission uses fluid coupling and cutting clutch? **(3 marks)**

d) State the main function of the stator in the torque converter principle. **(5 marks)**

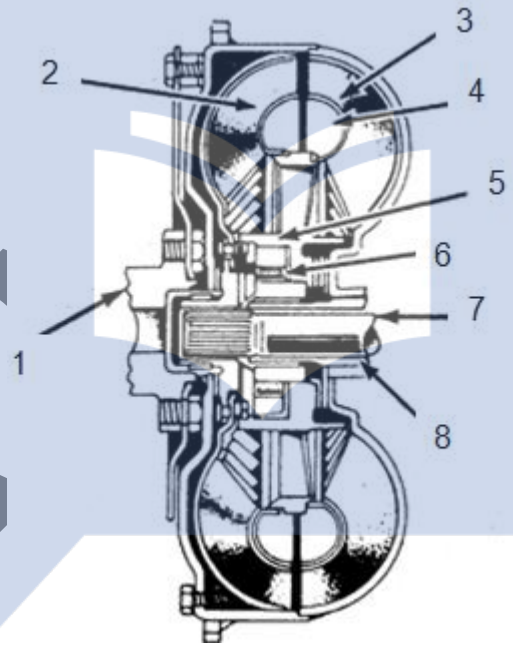

Figure 2

TOTAL (20MARKS)

3. **Figure3** below is a layout of air braking system.

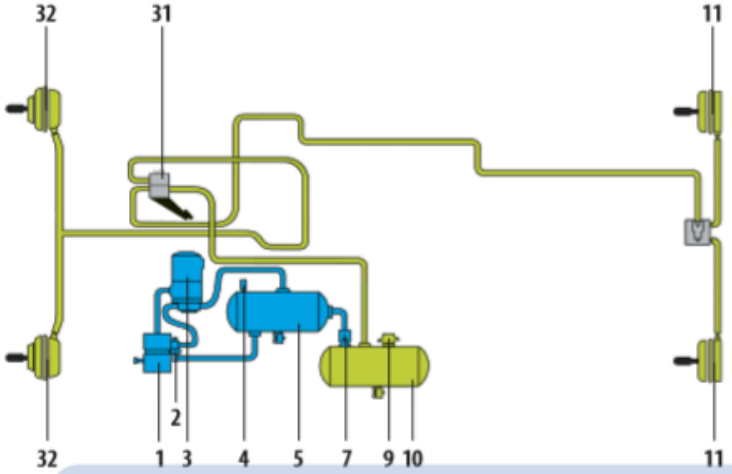

Figure 3

a) Identify the numbered parts 1, 2, 3, 4, 5, 7, 32. of the system **(3.5 marks)**

b) Describe the functioning of this air brakes circuit **(3 marks)**

c) Identify and describe the role of one-way check valve **(1.5 marks)**

d) Compare this system to a hydraulic brake system **(3marks)**

e) What must the driver do when a low-pressure warning system is activated? **(2 marks)**

f) Explain very briefly the common cause of loss of effective braking in air braking system **(4marks)**

g) Explain the effect of brakes fade in air braking system **(3 marks)**

TOTAL (20MARKS)

4. **Figure 4** below is a leaf spring used in heavy duty vehicles.

a) Name and give the role of the parts 1, 3, 6, 7, 8, 9, 13, 14 that constitute this spring assembly **(8 marks)**

b) How does this type of spring control the oscillation of the vehicle

i. In bound **(2 marks)**

ii. In rebound **(2 marks)**

c) Give and explain **TWO** effects of a defective leaf spring on the vehicle **(5 marks)**

d) In not more than five lines, compare this type of spring to the coil type **(3 marks)**

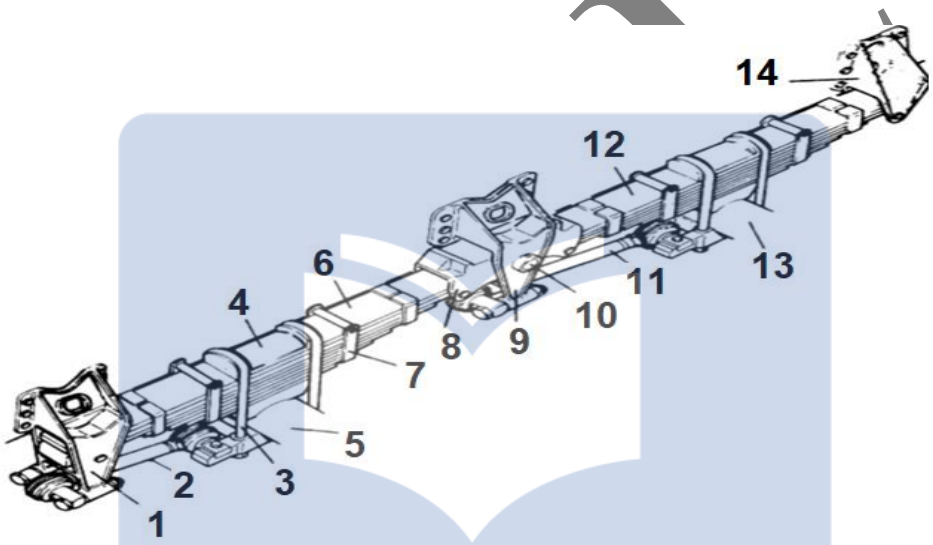

Figure 4

TOTAL (20MARKS)

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5. **Figure 5** below shows a test carried out on a unit of the final drive axle of a vehicle

Figure 5

a) Why is this test necessary in the final drive? **(3 marks)**

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b) Name the components numbered in the diagram? **(3 marks)**

c) Explain different ways in which you can notice a faulty final drive and differential unit **(5 marks)**

d) Explain briefly how the above test is being carried out **(5 marks)**

e) If the above test is negative, what must be done to remedy the situation **(2 marks)**

f) If the above test is positive and the reason for the test is persisting, what will be the next step to take **(2 marks)**

TOTAL (20MARKS)

SECTION B: CALCULATION AND SCIENCE

6. a) Define moment of a force **(2marks)**

b) Give **FOUR** applied areas on vehicle systems where moment of a force is practiced **(8marks)**

c) With the help of **Figure (6),** determine the effort F at the pedal to produce a force of 600 N on rod A. The pedal acts on a linkage as shown with pivots at P1, P2 and P310marks **(10 marks)**

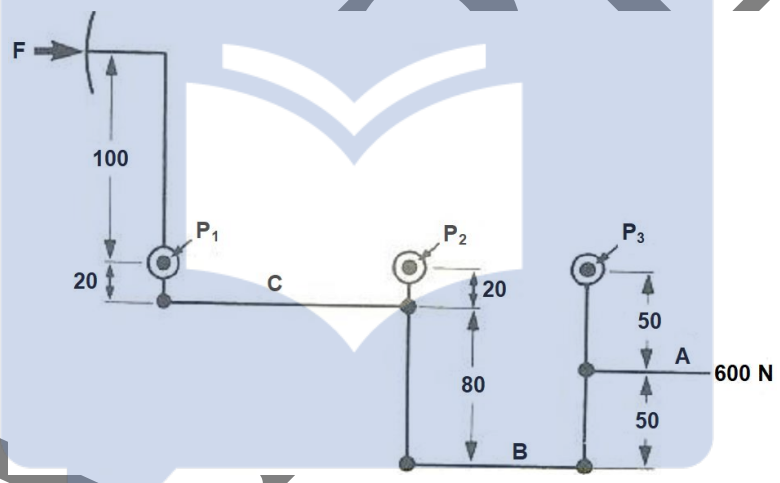

Figure 6

TOTAL (20MARKS)

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7. The **figure 7** below represents a mechanical gearbox.

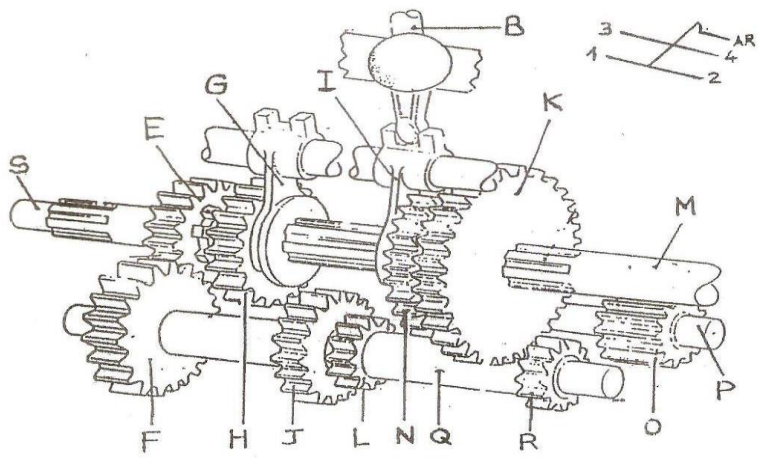

Figure 7

a) On your answer booklet designate the parts I,M,F,G,J,N,R and O of the above figure. **(8marks)**

N°	Name	N°	Name
B	Gear lever	J	
S	Input shaft	K	First speed's pinion
I		L	Second speed's intermediate pinion
M		N	
E	Input shaft's pinion	Q	intermediate shaft
F		R	
G		O	
H	Third speed's pinion	P	Reverse shaft

b) Calculate the ratio of reduction of this gearbox in the first speed, knowing that the pinions E, F, H, J, L, N, K and R have respectively 21, 33, 30, 27, 19, 28, 17, 41 teeth **(2marks)**

c) This gearbox lacks oil. Give two consequences **(5marks)**

d) State **TWO** disadvantages of this type of gearbox **(5marks)**

TOTAL (20MARKS)

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8) **Figure 8.1** below shows disc brakes

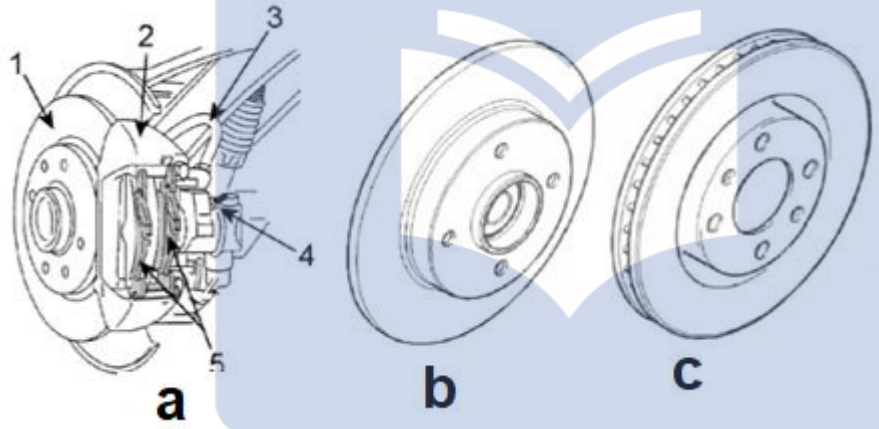

Figure 8.1

a) Identify and give the function of the numbered parts in **figure 8.1a** **(12marks)**

Part No	Name **(1 x 4 = 4marks)**	Function **(2 x 4 = 8 marks)**
1		
2		
3		
5		

b) Identify the elements in **figures 8.1b** and **8.1c** above **(1marks)**

c) Compare the elements in **figures 8.1b and 8.1c** above **(4marks)**

figures 7.b **(0.5 x 4 = 2 marks)**		figures 7.c **(0.5 x 4 = 2 marks)**	
Advantage	Disadvantage	Advantage	Disadvantage

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d) (i) The system below **(figure 8.2a)** shows a brake pedal/master cylinder diagram where the driver's effort is multiplied in function of the length of the lever. The driver's effort F_1 is 10 daN; the distance A is 20 mm; the distance B is 160 mm. Determine the force applied at the master cylinder F_2. **(1.5marks)**

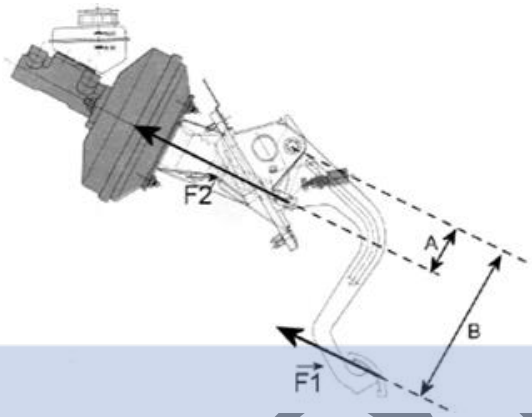

Figure 8.2a pedal/master cylinder diagram

ii) The system below shows a hydraulic amplification between the master cylinder and the wheel cylinder. The master cylinder piston s_1 has a surface area of $1cm^2$, the wheel cylinder s_2 has a surface area of $5cm^2$, $F_1 = F_2$ in question (i) above. Determine F_2 **(1.5marks)**

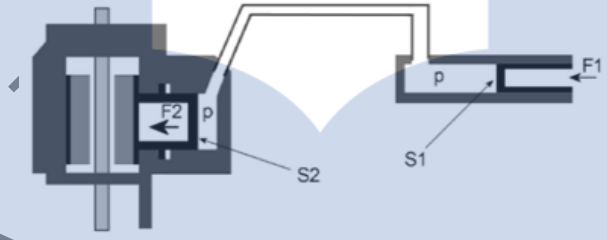

Figure 8.2b master cylinder/wheel cylinder circuit

TOTAL (20MARKS)