



# HPE – Pneumatic and Hydraulic Systems

## T092

**Thursday, 29/7/2021**

**08:30 – 11:30 AM**

**Names.**

**Index number**

**TVET NATIONAL EXAMINATION, RTQF LEVEL 5, 2020-2021**

# QUESTIONS and ANSWERS BOOKLET

OPTION/TRADE: **HYDROPOWER ENERGY**

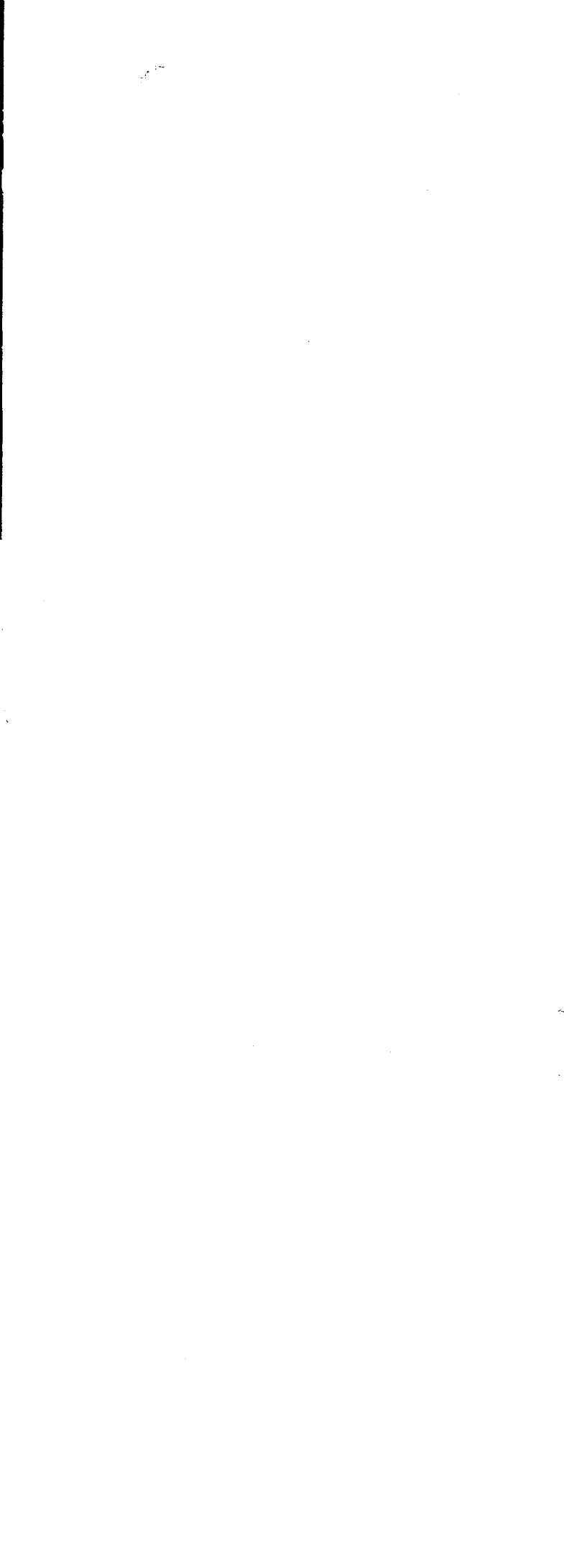
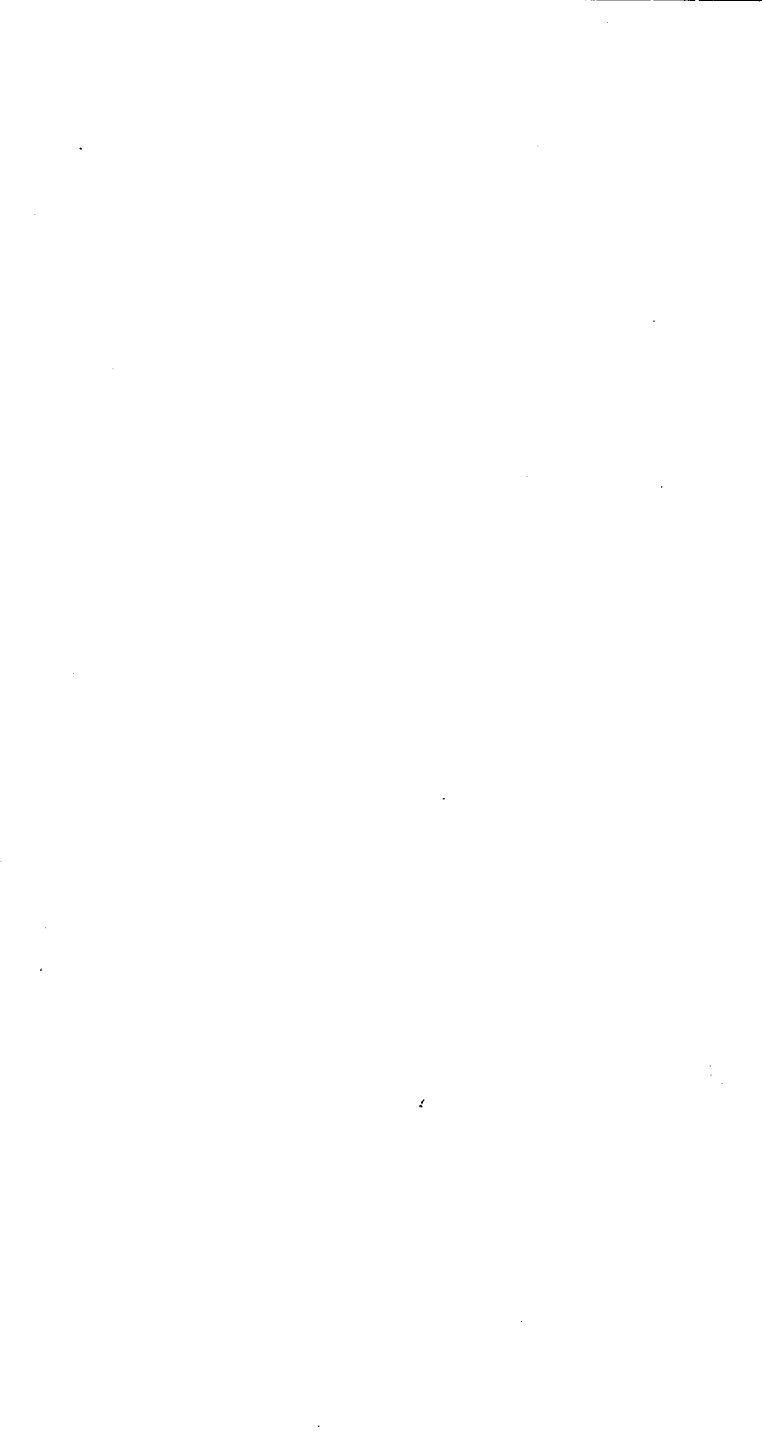
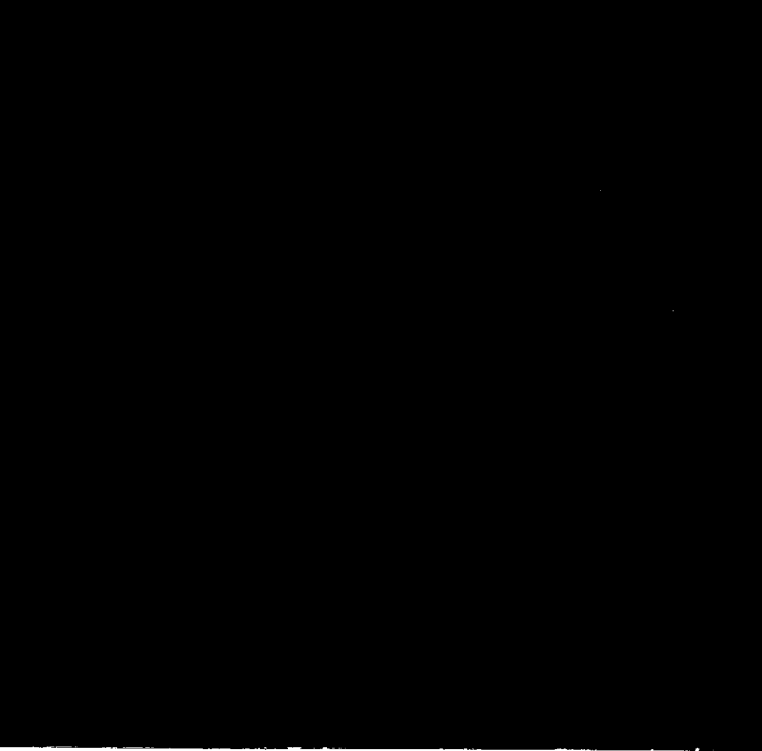
**SUBJECT: Pneumatic and Hydraulic Systems**

ACADEMIC YEAR: **2020-2021**

Read carefully the instructions on page (i) & (ii).

**FOR EXAMINER'S USE ONLY**

[illegible]



# TVET NATIONAL EXAMINATION, RTQF LEVEL 5, 2020-2021

## **INSTRUCTIONS TO CANDIDATES: PART I (Answer Booklet)**

1. A candidate should fill in the actual names and the index number on the cover of this questions and answer booklet on the provided place (Black Box).
2. It is illegal for a candidate to write any of his/her names, index number or a school name inside the answer booklet.
3. A candidate should check if all pages of the answer booklet are complete. No candidate should remove or tear any pages or part of it from the answer booklet.
4. A candidate should answer in the language in which the examination is set. (See page **(ii)**)
5. A candidate should sign on the sitting plan when submitting the answer booklet. He/she has also to check if the answer booklet is well sealed.
6. No extra paper is allowed in the examinations room. If a candidate is caught with it his/her results will be nullified.
7. No candidate is allowed to write answers not related to the subject being sat for, otherwise it will be considered as a cheating case.
8. Write your answers on the 12 lined pages (From page 1 of 12 to page 12 of 12).
9. Use the last non-lined pages as draft.
10. Results for any candidate who is caught in examination malpractices are nullified. The cheating can be recognized during examinations administration, marking exercise or even thereafter.

**TVET NATIONAL EXAMINATION, RTQF LEVEL 5, 2020-2021**

**OPTION/TRADE: HYDROPOWER ENERGY**

**SUBJECT: Pneumatic and Hydraulic Systems**

**DURATION: 3 hours**

**INSTRUCTIONS TO CANDIDATES: PART II (Question Paper)**

The paper is composed of two (2) main Sections as follows:

**Section I: Attempt all the Twelve (12) questions (60 marks)**

**Section II: Attempt any Four (4) questions out of Six (6)  
(40 marks)**

**Allowed materials:**

- Ruler and square
- Calculator

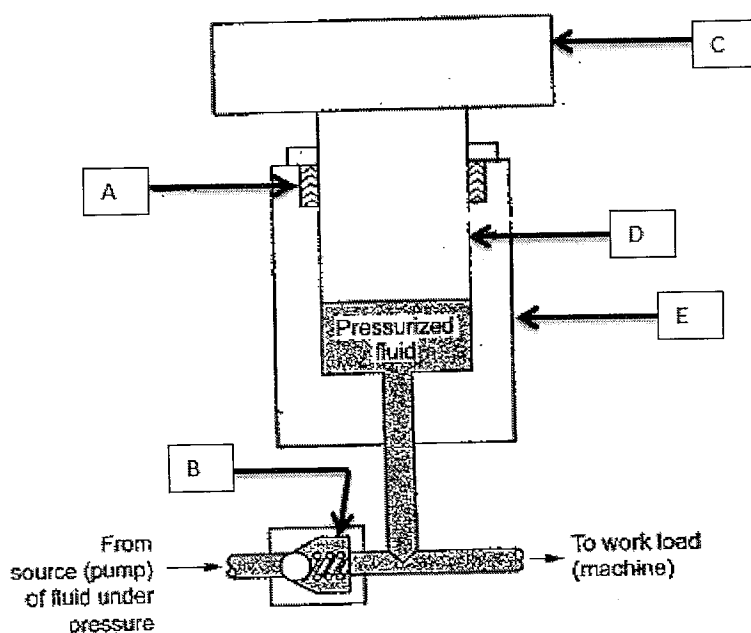
**Note:**

***Every candidate is required to carefully comply with the provided assessment instructions.***

**Section I: Attempt all the Twelve (12) questions****(60 marks)****01.** Copy and complete the table below:**(5 marks)**

S/N	Type of pressure valve	Function (role)
a)	Pressure limiting valve (relief valve)	
b)	Pressure reducing valve (pressure regulator valve)	
c)	Pressure sequence valve	
d)	Counterbalance valve (back-pressure valve)	
e)	Unloading valve	

**02.** Accumulator is the one of the accessories used in hydraulic system for storing hydraulic fluid under pressure. As a hydraulic system operator, write down the names of different parts of accumulator shown below:

**(5 marks)**

- 03.** Draw deliquescent air dryer (absorption air dryer), indicate all its parts.  
**(5 marks)**
- 04.** In pneumatic system there is a use of pneumatic controller for specific tasks, you are requested to draw proportional only pneumatic controller.  
**(5 marks)**
- 05.** Indicate the two (2) roles of after-cooler.  
**(5 marks)**
- 06.** What are the four (4) functions of oil tank?  
**(5 marks)**
- 07.** Enumerate any four (4) factors you must consider while designing pneumatic /hydraulic system.  
**(5 marks)**
- 08.** Identify any five (5) disadvantages of exhausting air noise in pneumatic system.  
**(5 marks)**
- 09.** Identify five (5) hazards due to the operation of pneumatic and hydraulic system.  
**(5 marks)**
- 10.** Mention any five (5) information you can find on the plate of the hydraulic pump.  
**(5 marks)**

**11.** Draw the symbols of the following elements:

- a) Directional control valve 4/2way valve
- b) Muffler or pneumatic silencer
- c) Double acting cylinder with double piston rod
- d) Shuttle valve
- e) Mechanical control roller.

**(5 marks)**

**12.** Enumerate any four (4) characteristics of directional control valve.

**(5 marks)**

**Section II: Attempt any Four (4) questions out of Six (6) (40 marks)**

**13.** List down at least five (5) types of pressure control valve and indicate the role of each type in the circuit.

**(10 marks)**

**14.** Identify any five (5) limitations and advantages of pneumatic system.

**(10 marks)**

**15.** Explain the working principle of deliquescent dryer.

**(10 marks)**

**16.** The piston rod of a double- acting cylinder is to advance when the 3/2-way roller valve 1S2 is actuated and the push button of the 3/2-way valve 1S1 is actuated. If either of these is released, then the cylinder is to return to the initial position. Draw the circuit diagram for the problem.

**(10 marks)**

17. (a) State and explain the four (4) ways of air compression.
- (b) The volume of gas is  $20\text{m}^3$  at  $15\text{N/cm}^2$  and  $100^\circ\text{C}$ . The temperature increases at  $700^\circ\text{C}$ , the volume is constant. Calculate:
- Final pressure
  - The internal energy.
- (10 marks)**
18. Below is a simple hydraulic power unit with piston pump. As a hydraulic system operator, name all its parts and explain its working operation:
- (10 marks)**

