NESA NATIONAL EXAMINATION AND SCHOOL INSPECTION AUTHORITY

IEL –Pneumatic and Hydraulic system

T050

Monday, 31/07/2023

08:30 – 11:30 AM

Names:.....

Index number:.....

TVET NATIONAL EXAMINATIONS, LEVEL 5, 2022-2023

QUESTIONS and ANSWERS BOOKLET

OPTION/ TRADE : INDUSTRIAL ELECTRICITY

SUBJECT/EXAM: PNEUMATIC AND HYDRAULIC SYSTEM

DURATION: 3 Hours

Read carefully the instructions on page 1 & 2.

FOR EXAMINER'S USE ONLY

QUESTIONS	1	2	3	4	5	6	7	8	9	10	Total
Marks											

QUESTIONS	11	12	13	14	15	16	17	18	19	20	Total
Marks											

QUESTIONS	21	22	23	24	25	26	27	28	29	30	Total
Marks											

TVET NATIONAL EXAMINATIONS, LEVEL 5, 2022-2023

INSTRUCTIONS TO CANDIDATES (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.
2. It is illegal for a candidate to write any of names, Index number or school name inside the answer booklet.
3. No candidate should remove or tear any pages or part of it in the answer booklet.
4. A candidate should answer in the language in which the examination is set.
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 16 lined pages (From page 7 to page 22).
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.

N.B: 1) After results publication, there is no remarking and no candidate is given his/her answer booklet for review. This answer booklet is a property of NESA.
2) Claims are only received online within 30 days after results publication. A link will be provided after results publication.

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SUBJECT/EXAM: PNEUMATIC AND HYDRAULIC SYSTEM

DURATION: 3 HOURS

INSTRUCTIONS TO CANDIDATES

This Exam paper is composed of Three Sections (A, B, and C). Follow the instructions given below, and answer the indicated questions for a total of 100 marks

Section **A**: Fourteen (**14**) questions, all **Compulsory**	**55 marks**
Section **B**: Among the five (**5**) questions, attempt any three (3)	**30 marks**
Section **C**: Among the two (**2**) questions, attempt any one (1)	**15 marks**

Allowed materials:

- Blue or black pen
- Mathematical set
- Non-programmable calculator

Note:

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

SECTION A: Attempt all questions **(55 marks)**

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01. List any three (3) types of measuring instruments used in pneumatic/hydraulic systems. **(3marks)**

02. State the three (3) methods of starting pneumatic/hydraulic systems. **(3marks)**

03. Give any three (3) control parameters used in pneumatic/hydraulic systems. **(3marks)**

04. Fill in the following statement by using:" **Limit switch**", "**Pressure switch**"," **Sensor**" **(3marks)**

a) ..... has a task of measuring information and passing this on to the signal processing part in a form that can easily be processed.

b) ..... is actuated when a machine part or work piece is in a certain position. Normally, actuation is affected by a cam

c) ..... is a mechanical device that relies on air pressure to control the operation of an electric air compressor. This simple mechanism completes the circuit and allows power to the motor as long as system is below a specified setting.

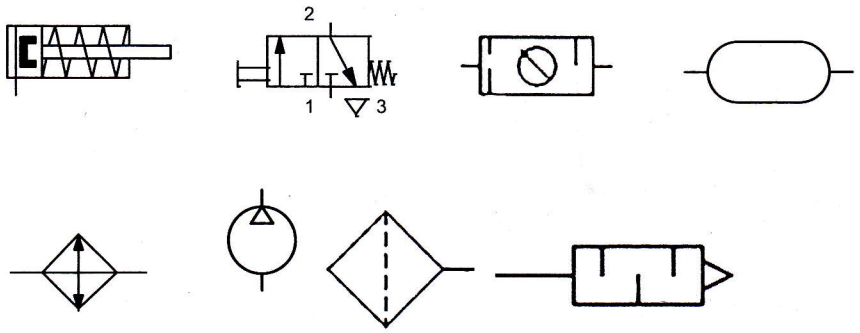
05. Draw a pneumatic circuit of the following components: Double acting cylinder in extending stroke, Air supply, FRL unit, 5/2 DCV, manually push-button control. **(4marks)**

06. Give any four (4) causes of hydraulic leakages found in hydraulic system. **(2marks)**

07. Describe the classification of control valves used in pneumatic/ hydraulic system. **(5marks)**

08. A force of 10KN is required to move a work piece. What is the needed working pressure, if the piston diameter is 100mm? **(3marks)**

09. Link correctly the following elements to make a pneumatic circuit: **(4marks)**



10. Compare the results when fluid viscosity is too thick and too thin than recommended. **(5marks)**

11. Sketch a pneumatic circuit of the following components: Double acting cylinder; 5/2 DCV, pilot operated on one side; 3/2 DCV with push button, normally closed; FRL unit; Pneumatic supply. **(5marks)**

12. Mention any five (5) tools/equipment used during the installation of pneumatic/hydraulic systems and give their roles. **(5marks)**

13. List any five (5) materials used in installation of pneumatic/hydraulic systems. **(5marks)**

14. Identify any two (2) tests of the following components of hydraulic system: Actuators; Valves; Oil Coolers; Accumulators; and Pumps **(5marks)**

Section B: Attempt any three (3) questions **(30 marks)**

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15. **a)** Identify any five (5) possible causes and remedies of hydraulic pump making noise. **(10marks)**

b) Explain the basic components of pneumatic system.

c) Determine the pressure of the system which has a pipe of 2000mm of diameter and force of 700daN.

16. **a)** Describe any three (3) elements of fluid conditioners used in pneumatic system. **(10marks)**

b) Compare the liquid with the gas used in pneumatic/hydraulic systems.

17. **a)** Describe any five (5) advices/tips that are used in troubleshooting of hydraulic system. **(10marks)**

b) A double acting cylinder is hooked up to reciprocate. The relief valve setting is 70 bars. The piston area is 0.016 m^2 and the rod area is 0.0045 m^2. If the pump flow is 0.0013m^3/s, determine the cylinder speed and the load- carrying capacity for the:

i) Extending stroke;

ii) Retracting stroke.

18. A double acting cylinder has a bore of 120mm. The rod is 45mm diameter and the stroke is 150mm. It must produce a pushing force of 12KN. The flow rate available in both directions is 15dm^3/min. Calculate the: **(10marks)**

a) System pressure needed.

b) Force with which it pulls given the same pressure.

c) Speed on the outward stroke

d) Speed of retraction.

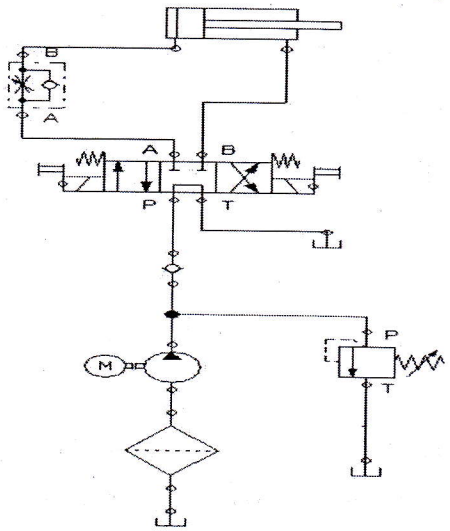
e) Power used on the out stroke.

19. **a)** Draw a pneumatic circuit which has the following components: Two silencers; One air motor with two directions of rotations; One 5/3, closed Centre, lever-detent actuated on both sides; Two one-way flow control valves; Two manometers that should be used to measure the pressure drop across the motor; One service unit; Pneumatic supply. **(10marks)**

b) Discuss the use of FRL unit in pneumatic systems installation.

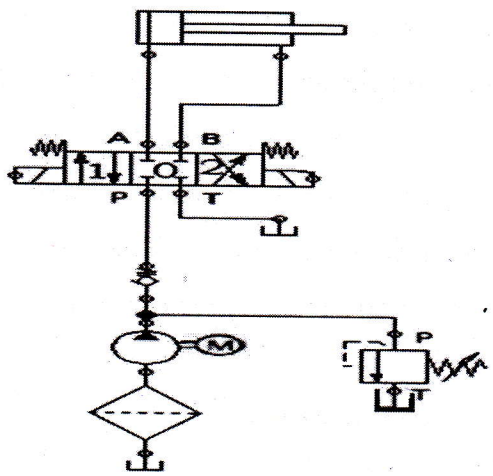
Section C: Attempt only one (1) question **(15 marks)**

20. **a)** Describe the operation of the following hydraulic circuit: **(15marks)**



b) Sketch a pneumatic circuit by using the components below. Bidirectional pneumatic motor; Air services unit; 5/3 directional control valve with pilot pneumatic and spring actuating in both directions; 3/2 directional control valves with push button, normal closed; Pneumatic supply.

21. **a)** Discuss the operations of the following hydraulic circuit: **(15marks)**



b) Sketch a pneumatic circuit of the following components:

- **i)** Double acting cylinder in retracting stroke.
- **ii)** Air supply
- **iii)** FRL unit
- **iv)** 5/2 DCV, manually push-button control.

END OF ASSESSMENT