NESA NATIONAL EXAMINATION AND SCHOOL INSPECTION AUTHORITY

IEL – Pneumatic and Hydraulic system

T050

Monday, 26/7/2021

08:30 – 11:30 AM

Names: .....

Index number: .....

TVET NATIONAL EXAMINATION, RTQF LEVEL 5, 2020-2021

QUESTIONS and ANSWERS BOOKLET

OPTION/TRADE: **INDUSTRIAL ELECTRICITY**

SUBJECT: **Pneumatic and Hydraulic system**

ACADEMIC YEAR: **2020-2021**

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

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 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: INDUSTRIAL ELECTRICITY

SUBJECT: Pneumatic and Hydraulic system

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)**

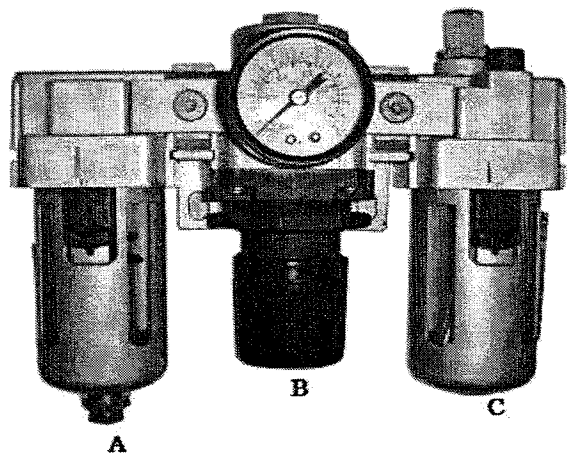
1. List down any five (5) PPE used while installing pneumatic and hydraulic system. **(5 marks)**

2. Draw the symbol of the following pneumatic/ hydraulic components:

a) Positive displacement pump
b) Variable displacement pump
c) Filter
d) Pressure relief valve
e) One way flow control valves. **(5 marks)**

3. Identify any five (5) tests conducted on accumulators. **(5 marks)**

4. Indicate the name for the following elements and their corresponding functions: (A,B,C)



(5 marks)

5. Differentiate partial commissioning from definitive commissioning. **(5 marks)**

6. Explain exhaustively the working principle of the centrifugal pump systems. **(5 marks)**

7. State the function of:

a) Air filter.

b) Air compressor.

c) Electric motor.

d) Valve.

e) Actuator. **(5 marks)**

8. Calculate the final/initial temperature of gas at the following specified conditions assuming that pressure and mass remain constant where V1 = 200 cm^3, V2 = 300 cm^3 and T1 = 27.^{0}C. **(5 marks)**

9. Give the symbol used to represent the following method of actuation of directional control valve:

a) Push button,
b) Spring,
c) Lever,
d) Pedal,
e) Electrical pilot. **(5 marks)**

10. An actuator forward speed is controlled by a meter-in circuit. The pressure setting of relief valve is 50 bar and the pump discharge = 30 litres /min. The cylinder has to carry a load of 3600 N during the forward motion. The area of piston is 15 cm^2 and rod area = 8cm^2. The flow control valve is set to allow only 10 litres/ min. Calculate the power input to motor, forward speed and return speed and efficiency of the circuit. **(5 marks)**

11. Double acting actuator speed control using a 3/2 pushbutton valve, a 5/2 Pilot controlled pneumatic valve and two flow control valves. Draw a pneumatic circuit. **(5 marks)**

12. A hydraulic cylinder is to compress a car body in 8 seconds. The operation requires a stroke of 2.5 m and a force of 45000N. If a 8 N/mm^2 pump has been selected, find the following:

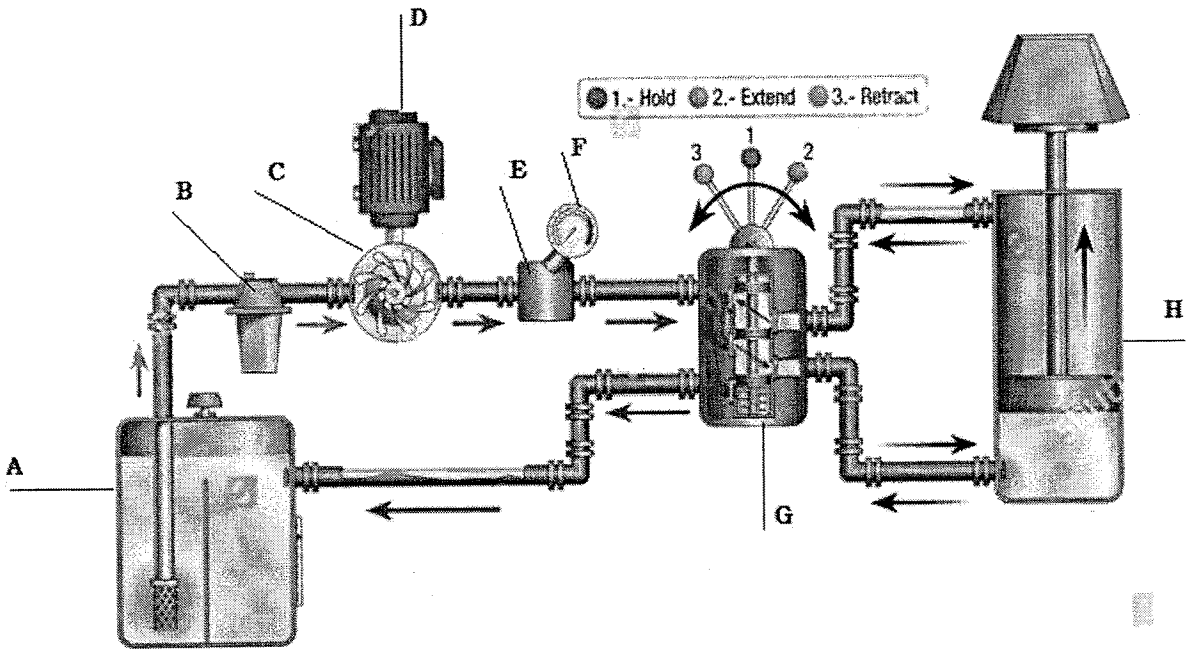
a) Required piston diameter
b) The necessary pump flow
c) The hydraulic power capacity in KW. **(5 marks)**

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

13. Identify at least five (5) tools and hand machines used while installing pneumatic & hydraulic system and their corresponding roles.

(10 marks)

14. Indicate the following elements and their functions: (A-H)

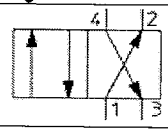
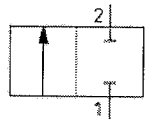
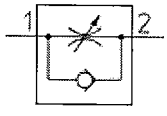
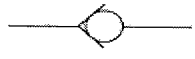
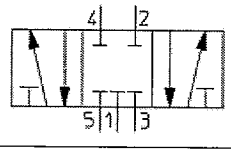


(10 marks)

15. Mention the seven (7) basic components required in a hydraulic system. **(10 marks)**

16. **(a)** A reservoir of 0.952 m3 volume is full and contains 1200 kg of glycerin. Calculate the glycerin's weight, density, specific weight, specific volume and specific gravity. **(5 marks)**

(b) Name the following valve symbols. **(5 marks)**

S/N	Symbols	NAMES
1		
		
		
		
		

17. **a)** Calculate the final volume of gas at the specified conditions assuming the temperature and mass remain constant. Where V1 = 200 cm^3, P1 = 600 mmHg and P2 = 800 mmHg

b) Enumerate any five (5) tools used in cleaning pneumatic and hydraulic systems. **(10 marks)**

18. A pump supplies oil at 1.5 Lps to a 50 mm diameter double-acting hydraulic cylinder. If the load is 4300N (extending and retracting) and the rod diameter is 25 mm, find:

a. Hydraulic pressure during the extending stroke
b. Piston velocity during the extending stroke
c. Cylinder KW power during the extending stroke
d. Hydraulic pressure during the retracting stroke
e. Piston velocity during the retracting stroke
f. Cylinder KW power during the retracting stroke. **(10 marks)**

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