NESA NATIONAL EXAMINATION AND SCHOOL INSPECTION AUTHORITY

HPE – Electrical Static Machines Winding and Rewinding

T090

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: **HYDROPOWER ENERGY**

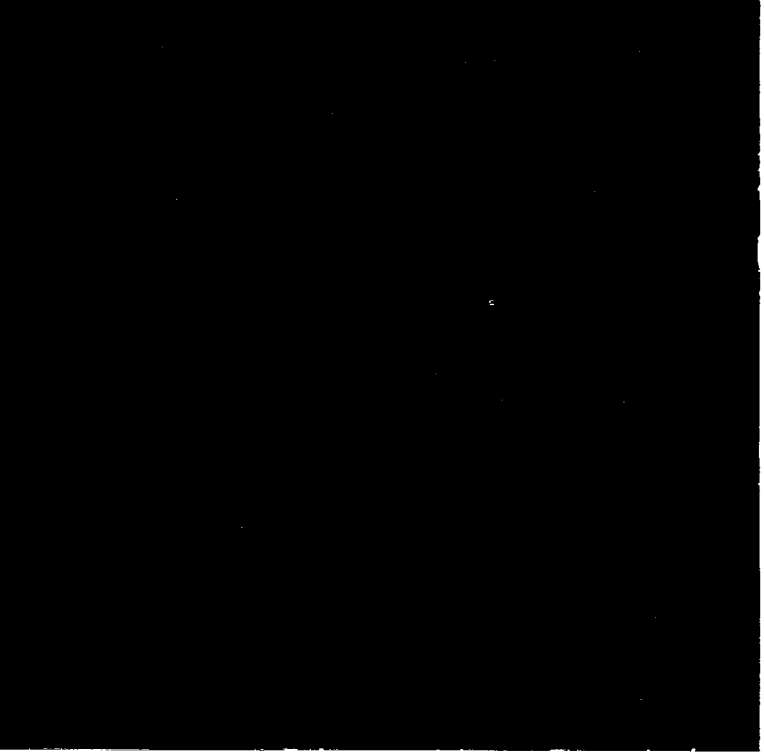
SUBJECT: **Electrical Static Machines Winding and Rewinding**

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: HYDROPOWER ENERGY

SUBJECT: Electrical Static Machines Winding and Rewinding

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. **(a)** What is a transformer?

(b) Differentiate core type transformer from shell type transformer.

(5 marks)

02. A 100KVA power transformer feeds a load operating at a power factor of 0.8. Find the efficient of a transformer if the combined iron and copper loss at this load is 1 KW. **(5 marks)**

03. **(a)** Explain the term "Dismantling" used in transformer winding/rewinding

(b) What are processes of transformer dismantling?

(5 marks)

04. What are different classifications of transformers according to?

(a) The principle of operation.

(b) The number of phases.

(c) The function. **(5 marks)**

05. Explain the working principle of a transformer. **(5 marks)**

06. What are different materials used to wind/rewind electrical static machines? **(5 marks)**

07. What are the advantages of double-wound transformers? **(5 marks)**

08. Write down any five (5) tools used to wind/rewind electrical static machine.

(5 marks)

09. **a)** If we consider the number of primary and secondary turns and the primary and secondary voltages of a transformer, when will the transformer be Step up or Step down? **(3 marks)**

b) If you have a transformer which is not installed, how can you differentiate the high voltage winding from the low voltage winding? **(2 marks)**

10. Explain the material used for core construction. **(5 marks)**

11. With the help of sketch, differentiate open circuit test from short circuit test of transformer and indicate their purposes. **(5 marks)**

12. A transformer has 600/150 turns. The primary and secondary resistance are 0.25Ω and 0.01Ω respectively and the corresponding leakage reactance are 1Ω and 0.04Ω respectively. Determine:

a) The equivalent resistance refers to the primary winding

b) The equivalent reactance refers to the primary winding

c) The equivalent impedance refers to the primary winding

d) The phase angle of the impedance. **(5 marks)**

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

13. A 3.3 Kv/220V, 50 Hz single phase transformer is to have an approximate emf per turn of 44V and operates with a maximum flux density of 1.5T. Calculate:

a) The number of primary and secondary turns

b) The cross sectional area of the core **(10 marks)**

14. **a)** A three -phase transformer has 500 primary windings turns and 50 secondary turns. If the supply voltage is 2.4 kV , find the secondary line voltage on no load when the windings are connected in:

i. Star – delta

ii. Delta – star

b) Write down three (3) uses of autotransformers. **(10 marks)**

15. The input current to a 3-phase step down transformer connected to an 11 KV supply system is 14 A. Calculate the secondary line voltage and current for:

a) Star-Star;

b) Delta-Star if the phase turn ratio is 44. **(10 marks)**

16. **a)** Write down the steps for transformer assembling. **(4 marks)**

b) A 3-phase, 50Hz transformer has a delta connected primary and star connected secondary, the line voltages being 22000V and 400V respectively. The secondary has a star-connected balanced load at 0.8 power factor lagging. The line current on the primary side is 5A. Determine the current in each coil of the primary and in each secondary line. What is the output of the transformer in KW?

(6 marks)

17. State advantages and disadvantages of auto transformer and their application. **(10 marks)**

18. **(a)** A transformer has 500 primary turns and 3000 secondary turns. If the primary voltage is 240 V, determine the secondary voltage, assuming an ideal transformer.

(b) An ideal transformer with a turns ratio of 2:7 is fed from a 240 V supply. Determine its output voltage.

(c) An ideal transformer has a turns ratio of 8:1 and the primary current is 3 A when it is supplied at 240 V. Calculate the secondary voltage and current. **(10 marks)**