





# 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 NESAs.
- 2) Claims are only received online within 30 days after results publication. A link will be provided after results publication.

**T 052\_ Pico-Hydropower Plant**

**TVET NATIONAL EXAMINATIONS, LEVEL 5, 2022-2023**

**OPTION/TRADE: INDUSTRIAL ELECTRICITY**

**SUBJECT/EXAM: PICO-HYDROPOWER PLANT**

**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

**Note:**

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

## **T 052\_ Pico-Hydropower Plant**

### **SECTION A: Attempt all questions**

**(55 marks)**

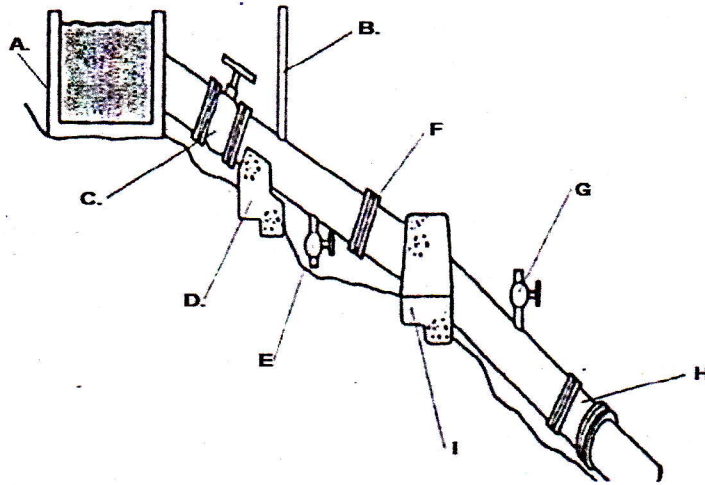
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- 01.** Define the following terms used in hydro power plant: **(4marks)**
- a) Gross head;
  - b) Net head.
- 02.** a) What are the three (3) main types of maintenance used in hydro power plant? **(5marks)**
- b) List any two (2) types of impulse turbine.
- 03.** Describe any three (3) necessities for synchronizing and parallel generator operation. **(3marks)**
- 04.** Complete the following sentences: **(3marks)**
- a) ..... is connected in series to measure an electrical current.
  - b) ..... is connected in parallel to measure voltage.
  - c) ..... is connected in parallel to measure an electrical power.
- 05.** Give any five (5) methods used to measure the flow rate of water to be used in hydropower. **(5marks)**
- 06.** Write the two (2) classifications of hydropower plants according to the grid connection. **(3marks)**
- 07.** Mention the four (4) main components of hydro power plant. **(4marks)**
- 08.** Give any four (4) power tools/equipment used in hydro- electric power plant. **(4marks)**
- 09.** Explain the four (4) conditions for connecting an alternator to the grid system. **(4marks)**



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10. Complete the parts of the figure below from **a to h**:

(5marks)



11. Explain the following kinds of energies:

(3marks)

- a) Kinetic energy;
- b) Potential energy;
- c) Electrical energy.

12. Describe the following parts of the hydropower plant:

(4marks)

- a) Dam;
- b) Surge tank;
- c) Power House;
- d) Penstock.

13. Draw the diagram of Pico hydropower plant and indicate the following components: Reservoir stone, penstock, anchor block, support piers, generator, turbine, tail race and power house.

(4marks)

14. Give the main purpose of synchroscope in hydro power plant.

(4marks)

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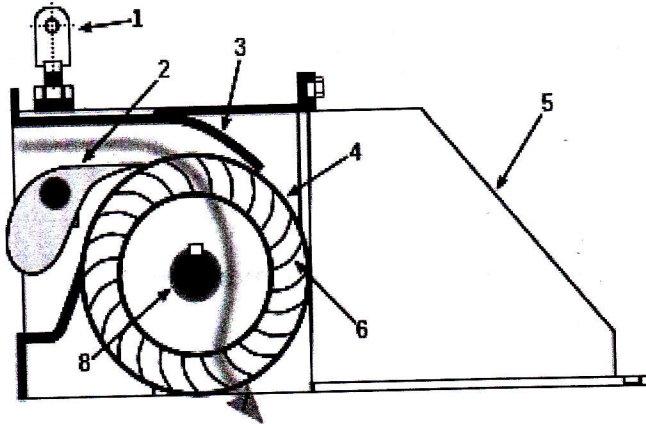
## Section B: Attempt any three (3) questions

(30 marks)

15. a) Explain the hierarchy of control risks at hydropower plant. (10marks)

b) Discuss the working principle of generator (alternator).

16. a) Complete the drawing below of cross flow turbine: (10marks)



b) Describe the three (3) main elements of an intake.

17. Explain any five (5) reasons why electrical energy is superior to other forms of energy. (10marks)

18. Explain any five (5) ways to make the hydropower station a safe workplace. (10marks)

19. Explain any four (4) emergency cases that should occur at hydropower plant. (10marks)

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### Section C: Attempt only one (1) question

(15 marks)

20. The daily demands of three consumers are given below:

(15marks)

Time	Consumer 1	Consumer 2	Consumer 3
12 midnight to 8 A.M.	No load	200 W	No load
8 A.M. to 2 P.M.	600 W	No load	200 W
2 P.M. to 4 P.M.	200 W	1000 W	1200 W
4 P.M. to 10 P.M.	800 W	No load	No load
10 P.M. to midnight	No load	200 W	200 W

a) Plot the load curve.

b) Calculate:

i) The Maximum demand of individual consumer;

ii) The Load factor of individual consumer;

iii) The Maximum demand of the station;

iv) The Diversity factor and;

v) The Load factor of the station.

21. a) Describe any five (5) electrical equipment used in hydropower (15marks) plant.

b) Three identical coils, each of resistance  $10\Omega$  and inductance  $42\text{mH}$  are connected in star to a  $415\text{V}$ ,  $50\text{Hz}$ , 3-phase supply. Determine the total power dissipated.

**END OF ASSESSMENT**