071305T4EOP

ELECTRICAL OPERATOR (POWER OPTION) LEVEL 5

ENG/OS/CR/CR/06/5/A

Install Solar Systems

July/August 2025

TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION COUNCIL (TVET CDACC)

WRITTEN ASSESSMENT

Time: 3 HOURS

INSTRUCTIONS TO CANDIDATE

1. This paper consists of **TWO** sections: **A** and **B**.
2. Attempt **ALL** questions in section A and **ANY THREE**.
3. Marks for each question are indicated in the brackets.
4. Candidates are provided with a separate answer booklet
5. **DO NOT** write on the question paper.

This paper consists of FIVE (5) printed pages

Candidate should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.

SECTION A (40 MARKS)

*Attempt **ALL** the questions in this section.*

1. With respect to the stem, define the following terms
   a. Module; (1 mark)
   b. Irradiance; (1 mark)
   c. Ir (1 mark)
2. You are requested by your institution to install solar panels in the workshop. State TWO precautions to be observed when handling a solar installation. (2 Marks)
3. During a conference on renewable energy sources, a power producer was giving presentations on different forms of energy. Identify TWO forms of energy directly derived from solar radiation. (2 marks)
4. List TWO applications for each form of solar energy identified in question (a) above. (2 marks)
5. A set has two batteries, each rated 12V/4A. Draw the connection circuit for the output to give:
   a. 8 A; (2 marks)
   b. 4 A. (2 marks)
6. John has a client who wants to buy solar system components for installation in his home. State THREE factors to consider when sizing a P.V solar system. (3marks)
7. There are different types of solar modules available for use for domestic purposes. State TWO:
   i. Advantages of mono-crystalline PV module; (2 marks)
   ii. Disadvantages of polycrystalline PV modules. (2 marks)
8. Solar power is referred to as green power. State FOUR demerits of solar power. (4 marks)
9. Acided to install solar system at his home. List THREE key factors to consider before selecting a solar panel system. (3 marks)
10. A company wants to buy a charge controller for their solar PV system and has engaged you as a solar expert to help in the exercise. State FIVE features of a

desirable charge controller you would consider in the process.

(5 marks)

11. You have two clients to install solar panels at their homes. Outline THREE environmental factors to consider when conducting site survey on solar PV installation.

(3marks)

12. After installing solar system to a client's home, she wants you to keep maintaining the system for her. State TWO solar PV maintenance procedures. (2marks)

13. In solar systems there are different types of charge controllers. List THREE types of charge controllers in solar PV systems. (3 marks)

SECTION B (60 MARKS)

Atstions in this section

14.
a) A TVET institution is aiming to use renewable energy as a source of power. You are engaged as a solar technician expert to guide on the sizing of the solar PV system to be installed. Describe the procedure for sizing the institution's solar PV system. (10 marks)

b) A company is planning to install a photovoltaic system in a new building. Using a block diagram. Describe FIVE components of a photovoltaic DC/AC system.

(10 mark)

15.
a) A client has the following electrical appliance for usage:

- One 18-Watt fluorescent lamp with electronic ballast used 4 hours per day.
- fan used for 2 hours per day.
- One 75-Watt refrigerator that runs 24 hours per day with compressor run 12 hours and off 12 hours.

The system will be powered by 12v DC, and the available module in the market is 100Wp and assuming a generation factor of 5. Design the solar PV system of the cli eing:

i. The number of solar modules (4 marks)

ii. The number of batteries required, considering 3 days of autonomy, 80% efficiency and 60% depth of discharge, given that the 100Ah batteries are available in the local market; (4 marks)

iii. The size of the charge controller, given I_{sc} = 7.5A; (3 marks)

, factoring in 30% efficiency. (3 marks)

b) Explain THREE methods of mounting a solar module or solar array. (6 marks)

16.

a) Describe FIVE different applications of solar energy that could be utilized by a community centre. (10 marks)

b) A solar farm manager is analyzing the performance of solar panels. Discuss FIVE factors that affect the changes in the output of solar cell modules. (10 marks)

17.

a) As a solar expert, state TWO ways you would use to measure the state of charge of a battery. (2 marks)

b) You have successfully installed a new battery for a client. Explain FOUR battery maintenance practices you would advise him to regularly perform on his battery to maximize its life. (8 marks)

c) Your institution wants to buy batteries for a solar PV system and has engaged you as a solar expert to help in the exercise. Explain FIVE factors of a desirable battery you would advise them to consider. (10 marks)