

**SEN - Solar Power Plant Design
and Installation
T132**
Thursday, 29/7/2021
08:30 - 11:30 AM

SEN

Names:
Index number:
JMV

TVET NATIONAL EXAMINATION, RTQF LEVEL 5, 2020-2021

QUESTIONS and ANSWERS BOOKLET

OPTION/TRADE: **SOLAR ENERGY**
SUBJECT: **Solar Power Plant Design and Installation**
ACADEMIC YEAR: **2020-2021**

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

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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											

Section I : Attempt all the Twelve (12) questions

(60 marks)

- 01. a)** What is the meaning of solar power plant?
b) Explain the working principal of a solar power plant. **(5 marks)**
- 02.** State any four (4) criteria based on site selection considerations of solar power plant. **(5 marks)**
- 03.** List out any five (5) main components of solar power plant. **(5 marks)**
- 04.** Identify the factors determining the solar wire size. **(5 marks)**
- 05.** List any five (5) key factors based on selecting cable used in solar power plant. **(5 marks)**
- 06.** Define the following terms:
a) Solar energy
b) Solar cell
c) Solar photovoltaic effect
d) Irradiance:
e) Insolation. **(5 marks)**
- 07.** Write the following terms in full words:
a) DOD
b) LVD
c) HVD
d) HVR
e) LVR. **(5 marks)**
- 08.** Mention the advantages of Solar Home Systems. **(5 marks)**

- 09.** Give the difference between Solar Home Systems and Centralized Solar PV system (Mini-grid systems).
(5 marks)
- 10.** Identify five (5) basic tools used in solar power plant installation.
(5 marks)
- 11.** State any five (5) benefits of keeping a maintenance record.
(5 marks)
- 12.** Mention at least five (5) possible causes of failing PV module components.
(5 marks)

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

(40 marks)

13. Explain the main methods of data collection to be used in elaboration of bill of quantity. **(10 marks)**

14. A house has the following electrical appliance usage:

- One 18Watt fluorescent lamp with electronic ballast used 4 hours per day.
- One 60Watt fan used for 2 hours per day.
- One 75Watt refrigerator that runs 24 hours per day. Peak sun hour is 5
- The system will be powered by 12 Vdc, 110 Wp PV module, number of autonomy days 3, efficiency of battery 85%, depth of battery 90%

a. Calculate the number of panels needed

b. Calculate the battery capacity to be used.

(10 marks)

15. The following are details of the loads to be used in remote area for small health center powered by solar PV. The following assumptions have to be considered:

- Inverter efficiency= 90%
- Battery efficiency= 90%
- DOD =70%
- Autonomy days= 3
- PV module available at the market 90WP/12v
- Available battery capacity 150Ah@24V,DC
- Peak sun hours=4.5hours

No	Description of load	Power consumption (W)	Number of devices	Daily operating hours (h)	Operating voltage (V)
1	Lamps	10	10	12	24
2	Fan	20	5	10	24
3	Halogen lamps	200	2	2	24
4	Small vaccine refrigerator	240Wh	1	12	24
5	Color TV	40	1	5	220v, ac

Calculate all necessary equipment in order to have a full solar PV installation for economic purpose.

(10 marks)

16. Explain the applications of solar PV systems. **(10 marks)**

17. Explain common types of testing conducted on PV systems. **(10 marks)**

18. Explain briefly the methods of Waste Disposal and list the advantages for each method. **(10 marks)**