

Unit 7 - Week 5: Standalone Photovoltaic System

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Assignment 5

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

Due on 2020-10-21, 23:59 IST.

1) Cycle lifetime is the number of charging and discharging cycles after the battery capacity drops below _____ of the nominal value. **1 point**

- a. 40%
 b. 20%
 c. 80%
 d. 60%

No, the answer is incorrect.

Score: 0

Accepted Answers:
c. 80%

2) At lower temperature, battery life _____ and battery capacity _____. **1 point**

- a. decreases, increases
 b. increases, decreases
 c. increases, increases
 d. decreases, decreases

No, the answer is incorrect.

Score: 0

Accepted Answers:
b. increases, decreases

3) A PV system is utilized to power a DC motor to produce 3 HP shaft power. The motor efficiency is 82%. Each module has 36 multicrystalline silicon solar cells arranged in a 9 x 4 matrix. The cell size is 125 mm x 125 mm and the cell efficiency is 12.5%. If the global radiation incident normally to the panel is 945 Watt per sq. meter, the number of modules required in the PV array is **1 point**

- a. 33
 b. 26
 c. 50
 d. 41

No, the answer is incorrect.

Score: 0

Accepted Answers:
d. 41

4) A PV system of 12 V has two DC appliances A and B requiring 25 and 30 W respectively. The average operational time per day is 6 hours for device A and 3 hours for device B. The total daily requirement (in Ampere-hour) of the devices is **1 point**

- a. 15
 b. 8
 c. 20
 d. 25

No, the answer is incorrect.

Score: 0

Accepted Answers:
c. 20

5) A 10 Ampere-hour battery that has been drained by 3 Ampere-hour is said to have a SOC (in %) and DOD (in %) of **1 point**

- a. 70, and 30 respectively
 b. 30, and 70 respectively
 c. 50, and 50 respectively
 d. 80, and 20 respectively

No, the answer is incorrect.

Score: 0

Accepted Answers:
a. 70, and 30 respectively

6) In PV arrays, collectors are connected in series and parallel to maximize the values of **1 point**

- a. Voltage and current respectively
 b. Current and voltage respectively
 c. Power and current respectively
 d. Power and voltage respectively

No, the answer is incorrect.

Score: 0

Accepted Answers:
a. Voltage and current respectively

Common data for Q7-Q9

To supply drinking water in a village, government has released an order for installation of a solar photovoltaic system. The water has to be pumped from a depth of 51 m from a bore well. The solar cells are made from single crystal silicon and the array consists of 24 modules of the following specifications: Module size: 119.1 cm x 53.3 cm, Cell size: 12.5 cm x 12.5 cm, number of cells: 36, nominal output: 80 W, Nominal voltage: 12 V, Maximum voltage: 17 V, Open circuit voltage: 21.2 V, Short circuit current: 5 A. The inverter efficiency is 86% and pump-motor set efficiency is 48%. Consider the global radiation incident normally on the cells is 920 Watt per sq. meter and conversion efficiency based on the cell is 12.5%. Take density of water to be 996 kg per cu. meter.

7) The power output (in Watt) from the array is **1 point**

- a. 1624.8
 b. 1552.5
 c. 1428.6
 d. 1767.3

No, the answer is incorrect.

Score: 0

Accepted Answers:
b. 1552.5

8) The power (in Watt) available for lifting water is **1 point**

- a. 640.8
 b. 550.2
 c. 725.9
 d. 610.4

No, the answer is incorrect.

Score: 0

Accepted Answers:
a. 640.8

9) The water discharge rate (in Liters per hour) is **1 point**

- a. 3050.5
 b. 5412.8
 c. 4629.4
 d. 6274.3

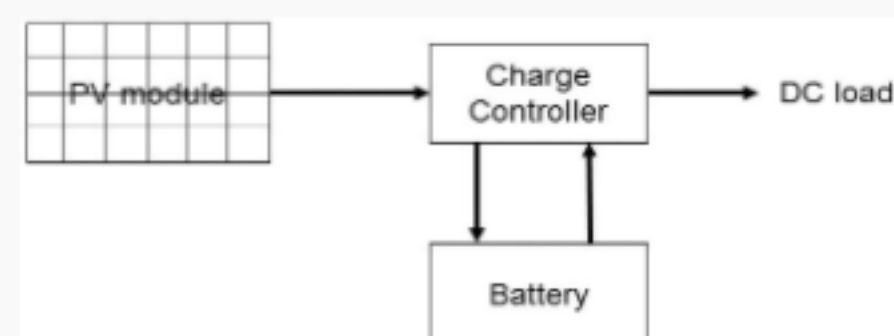
No, the answer is incorrect.

Score: 0

Accepted Answers:
c. 4629.4

Common data for Q10-Q12

A solar PV-LED lamp having driver efficiency of 85% operates with a voltage of 3.2 V DC and draws a current of 0.15 A. The lamp is required to operate for 5 hours every night. Consider the configuration of a stand-alone PV system shown in the figure below. The PV module efficiency is 15%, while the battery charging and discharging efficiency are 95% and 93% respectively. The battery voltage is 2.4 V and the depth of discharge is 80%.



10) If the daily average global radiation is 4 kWh per sq. meter, the rating of the PV module (in Watt peak) is **1 point**

- a. 2.0
 b. 0.2
 c. 0.8
 d. 1.5

No, the answer is incorrect.

Score: 0

Accepted Answers:
c. 0.8

11) If the loss factor of the module is 0.9, the area of the module (in sq. cm) is **1 point**

- a. 80.0
 b. 65.3
 c. 48.5
 d. 59.2

No, the answer is incorrect.

Score: 0

Accepted Answers:
d. 59.2

12) The capacity of the battery (in Ampere-hour) is **1 point**

- a. 1.58
 b. 3.62
 c. 4.10
 d. 2.89

No, the answer is incorrect.

Score: 0

Accepted Answers:
a. 1.58

Common data for Q13 and Q14

A residential house has a power requirement of 500 W for 5 hours every night. It is proposed to meet the requirement by using a PV array, a battery storage and inverter system is over designed to meet 2 extra night requirement even if there been no sunshine during the day. The global radiation incident normally on the cell is 650 Watt per sq. meter and radiation available for average of 6 hours. The specification of the module: Module size: 119.1 cm x 53.3 cm, Cell size: 12.5 cm x 12.5 cm, number of cells: 36, conversion efficiency of the cell is 10%. The battery rating is 12 V, 120 Ah with depth of discharge 0.7, charging and discharging efficiency of 90%. The inverter efficiency at full load to be taken as 85%.

13) The total number of modules required **1 point**

- a. 35
 b. 55
 c. 50
 d. 42

No, the answer is incorrect.

Score: 0

Accepted Answers:
c. 50

14) The total number of batteries required **1 point**

- a. 10
 b. 6
 c. 15
 d. 17

No, the answer is incorrect.

Score: 0

Accepted Answers:
a. 10