

Unit 10 - Week 8: Flat Plate Collectors

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Assignment 8

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

Due on 2020-11-11, 23:59 IST.

1) In a Flat Plate Collector, higher values of absorptivity and lower values of long-wavelength emissivity, can be achieved by choosing a _____ **1 point**

- a. selective absorber surface
 b. Suitable location
 c. Suitable tilt angle towards the sun
 d. None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. selective absorber surface

2) The expression for side loss coefficient in a Liquid Flat Plate Collector is given by **1 point**

- a. $\frac{\delta}{k_f}$
 b. $\frac{k_f}{\delta}$
 c. $\frac{(L_1 + L_2)L_3 k_f}{L_1 L_2 \delta}$
 d. None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. $\frac{(L_1 + L_2)L_3 k_f}{L_1 L_2 \delta}$

3) The fin efficiency (F) of the absorber plate in a FPC depends on **1 point**

- a. length of the collector
 b. breadth of the collector
 c. distance between the two risers
 d. None of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. distance between the two risers

4) Which of the following statements regarding evacuated tube collectors (ETC) are true? **1 point**

- I. ETC is used for high temperatures up to 150 °C.
II. Because of use of vacuum between two concentric glass tubes, a higher amount of heat is retained in ETC.
III. Heat loss due to conduction back to atmosphere from ETC is high.
IV. Performance of an evacuated tube is highly dependent upon the ambient temperature.

- a. I & III are correct
 b. II & III are correct
 c. I & IV are correct
 d. I & II are correct

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. I & II are correct

5) With increase in fluid inlet temperature for Flat Plate Collectors, the collector efficiency **1 point**

- a. increases
 b. decreases
 c. remains unchanged
 d. may increase or decrease

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. decreases

6) To get higher delivery temperature by Flat Plate Collectors, the collectors should be connected in **1 point**

- a. Series
 b. Parallel
 c. a combination of parallel and series
 d. all of these

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. Series

Common data for Q7 and Q8

A Flat Plate Collector has an aluminium absorber plate (thermal conductivity of 208 Watt per meter per degree Celsius) of thickness 0.32 millimeter and an area of 1.5 square meter, and it has two riser tubes each of diameter 0.025 meter. The width of the spacing between the two riser tubes is 0.114 meter. The length of the tubes being 1 meter and the convective heat transfer coefficient from the inner tube surface to the water is 50 Watt per square meter per degree Celsius. The overall loss coefficient is 7.0 Watt per square meter per degree Celsius.

7) The fin efficiency factor for the collector is **1 point**

- a. 0.80245
 b. 0.85252
 c. 0.87255
 d. 0.93592

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. 0.93592

8) The collector efficiency factor for the collector is **1 point**

- a. 0.79627
 b. 0.84735
 c. 0.88475
 d. 0.94425

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. 0.79627

Common data for Q9 and Q10

An industry requires 4000 litres of hot water per day at 70 degree Celsius as process heat. The supply of hot water was carried out using a geyser having electrical efficiency of 95 %. Per unit cost of electricity is Rupees (₹) 7. In order to reduce electricity bill, the industry has opted for solar thermal device to meet the requirement. The conversion efficiency of the solar thermal collector is 36 %.

Annual average daily global solar radiation on horizontal surface at the location is 5.8 kilo Watt hour per square meter and average ambient temperature is 27 degree Celsius.

9) The required area of the solar thermal collector (square meter) will be **1 point**

- a. 84.65
 b. 95.65
 c. 210.23
 d. 344.34

No, the answer is incorrect.
Score: 0

Accepted Answers:
b. 95.65

10) Monthly saving in electricity bill (Rupees (₹)) is **1 point**

- a. 14700
 b. 26000
 c. 37450
 d. 44150

No, the answer is incorrect.
Score: 0

Accepted Answers:
d. 44150

Common data for Q11 and Q12

For a Flat Plate Collector, the following data are available:

- Top loss coefficient = 6.65 Watt per square meter per degree Celsius
- Back insulation thickness = 0.04 meter
- Insulation conductivity = 0.038 Watt per meter per degree Celsius
- Collector bank length = 7.5 meter
- Collector bank width = 2.4 meter
- Collector thickness = 0.08 meter
- Edge insulation thickness = 0.025 meter

11) The side loss coefficient (Watt per square meter per degree Celsius) is **1 point**

- a. 0.133
 b. 0.533
 c. 0.95
 d. 1.90

No, the answer is incorrect.
Score: 0

Accepted Answers:
a. 0.133

12) The overall loss coefficient (Watt per square meter per degree Celsius) is **1 point**

- a. 2.853
 b. 6.655
 c. 7.733
 d. 9.535

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 7.733

13) The following data are available for a Flat Plate collector under forced circulation mode of operation: **1 point**

- Solar insolation available= 500 Watt per square meter
- Average transmissivity-absorptivity product = 0.8
- Overall heat loss co-efficient = 6.0 Watt per square meter per degree Celsius
- Fluid inlet temperature = 60 degree Celsius
- Ambient temperature = 30 degree Celsius
- Flat plate heat removal factor = 0.35
- Ratio of absorber plate area to collector area = 0.91

Using Hottel-Whillier-Bliss equation, instantaneous thermal efficiency of the FPC is found to be

- a. 11.01 %
 b. 12.39 %
 c. 14.01 %
 d. 21.55 %

No, the answer is incorrect.
Score: 0

Accepted Answers:
c. 14.01 %