

## Unit 11 - Week 9: Solar Air Heaters

Course outline
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## Assignment 9

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

**Due on 2020-11-18, 23:59 IST.**

1) The heat transfer coefficient in case of solar air heaters is improved by 1 point

- a. providing roughened surfaces or longitudinal fins in the air flow passage
- b. increasing the mass flow rate
- c. cleaning the glazing surface
- d. none of these

No, the answer is incorrect.  
Score: 0

Accepted Answers:

a. providing roughened surfaces or longitudinal fins in the air flow passage

2) The solar air heater is more effective and economical compared with the liquid FPC due to 1 point

- a. no leakage problem
- b. corrosion less
- c. no freezing
- d. all of these

No, the answer is incorrect.  
Score: 0

Accepted Answers:

d. all of these

3) When the vapor pressure exerted by the moisture of the drying product equals the vapor pressure of the nearby ambient air, the moisture content is termed **1 point** as

- a. Bound moisture
- b. Free moisture
- c. Unbound moisture
- d. Equilibrium moisture

No, the answer is incorrect.  
Score: 0

Accepted Answers:

d. Equilibrium moisture

4) The solar air collector is mostly operated under 1 point

- a. natural mode
- b. forced mode
- c. turbulent mode
- d. none of these

No, the answer is incorrect.  
Score: 0

Accepted Answers:

b. forced mode

5) The Blasius equation expression for dimensionless pressure drop in the duct for smooth surfaces is 1 point

- a.  $f = 0.079 Re^{0.25}$  for  $2100 < Re < 10^5$
- b.  $f = 0.079 Re^{-0.25}$  for  $2100 < Re < 10^5$
- c.  $f = 0.0014 + 0.125 Re^{-0.32}$  for  $10^4 < Re < 10^7$
- d.  $f = 0.0014 + 0.125 Re^{0.32}$  for  $10^4 < Re < 10^7$

No, the answer is incorrect.  
Score: 0

Accepted Answers:

b.  $f = 0.079 Re^{-0.25}$  for  $2100 < Re < 10^5$

6) The outlet air temperature of a solar air collector 1 point

- a. decreases with a decrease of the mass-flow rate
- b. increases with a decrease of the mass-flow rate
- c. is unaffected with a decrease of the mass-flow rate
- d. none of these

No, the answer is incorrect.  
Score: 0

Accepted Answers:

b. increases with a decrease of the mass-flow rate

#### Common data for Q7 - Q9

The following data is available for a solar air heater having dimension of (1.5 m X 1.2 m):

- Air flow rate = 150 kg per hour
- Air inlet temperature = 55 degree Celsius
- Ambient temperature = 25 degree Celsius
- Solar flux on the collector face = 910 Watt per square meter
- Average transmissivity-absorptivity product = 0.8
- Overall loss coefficient (Neglecting side loss) = 7.28 Watt per square meter per degree Kelvin
- Spacing between absorber plate and bottom plate = 1.2 cm
- $\epsilon_p = \epsilon_b = 0.9$

Assume at mean fluid temperature of 60 degree Celsius, the properties of air are:

- Density of air = 1.059 kg per cubic meter
- Dynamic Viscosity =  $20.08 \times 10^{-6}$  Newton second per meter square
- Thermal conductivity = 0.02808 Watt per meter per degree Kelvin
- Specific heat = 1007 Joule per kg per degree Kelvin

7) The value of effective heat transfer coefficient (Watt per square meter per degree Kelvin) is 1 point

- a. 6.86
- b. 12.55
- c. 16.99
- d. 19.42

No, the answer is incorrect.  
Score: 0

Accepted Answers:

c. 16.99

8) The useful heat gain rate (watt) from the collector is 1 point

- a. 480.2
- b. 576.8
- c. 814.5
- d. 975.8

No, the answer is incorrect.  
Score: 0

Accepted Answers:

b. 576.8

9) The value of dimensionless pressure drop in the duct is 1 point

- a. 0.01033
- b. 0.62883
- c. 0.70007
- d. 3.20195

No, the answer is incorrect.  
Score: 0

Accepted Answers:

a. 0.01033

#### Common data for Q10 - Q12

A solar chimney plant of 280 meter height is installed in collection area of 45000 square meter. Temperature of the ambient air is 30 degree Celsius and specific heat of air is 1005 Joule per kg per degree Kelvin. Solar energy availability in the location is 6.2 kilowatt-hour per square meter. Assume turbine-generator set converts only 55% out of the maximum available energy into electrical energy and the collection efficiency of the greenhouse to be 24%.

10) The maximum possible conversion efficiency obtainable with the solar chimney is 1 point

- a. 0.82
- b. 0.90
- c. 0.99
- d. 1.12

No, the answer is incorrect.  
Score: 0

Accepted Answers:

b. 0.90

11) The overall efficiency of the plant is 1 point

- a. 0.119
- b. 0.99
- c. 1.09
- d. 1.19

No, the answer is incorrect.  
Score: 0

Accepted Answers:

a. 0.119

12) Daily electrical output of the solar chimney plant (kilowatt-hour) is 1 point

- a. 112
- b. 165
- c. 332
- d. 2516

No, the answer is incorrect.  
Score: 0

Accepted Answers:

c. 332