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reviewer4@nptel.iitm.ac.in ▼

Courses » Radiative Heat Transfer

Announcements

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Unit 2 - Week 1

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Course outline

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Week 1

- Introduction
- Fundamentals of Radiation
- Basic Laws of Thermal Radiation
- Properties of Plane Surfaces
- Radiative Properties of Materials
- Quiz : Assignment 1
- Solution of Assignment 1

Week 2

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Assignment 1

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment. **Due on 2019-02-13, 23:59 IS**

1) The Sun emits maximum radiation at $0.50 \mu\text{m}$. If the temperature of the surface of the Sun is 6000 K and the temperature of the Earth's surface is 300 K , the wavelength at which the Earth's maximum radiation is emitted is **1 point**

- $10.0 \mu\text{m}$
- $1.00 \mu\text{m}$
- $0.250 \mu\text{m}$
- $0.025 \mu\text{m}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$10.0 \mu\text{m}$

2) An electric flat-plate square heater of side 10 cm provides 100 W power from each side. If the heater is assumed black, its temperature is approximately **1 point**

- 6480 K
- 648 K
- 100 K
- 1000 K

No, the answer is incorrect.

Score: 0

Accepted Answers:

648 K

3) The Sun may be assumed to behave like a black body at a temperature of 5780 K . The spectral intensity of solar radiation at a wavelength of $0.55 \mu\text{m}$ is **1 point**

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No, the answer is incorrect.**Score: 0****Accepted Answers:** $256 \times 10^5 \text{ W}/(\text{m}^2 \cdot \mu\text{m}\cdot\text{s})$ 4) If the wavelength of a certain radiation beam is $0.50 \mu\text{m}$, its wave number is **1 point**

- 40000 cm^{-1}
- 10000 cm^{-1}
- 20000 cm^{-1}
- 2000 cm^{-1}

No, the answer is incorrect.**Score: 0****Accepted Answers:** 20000 cm^{-1} 5) Assuming Earth to be a black sphere with a surface temperature of 300 K, the internal heat generation of Earth in order to maintain its temperature is (neglect radiation from the stars, but not the sun) (radius of the Earth $R=6.37 \times 10^6 \text{ m}$) **1 point**

- $8.31 \times 10^{16} \text{ W}$
- $6.17 \times 10^{16} \text{ W}$
- $6.17 \times 10^{18} \text{ W}$
- $8.31 \times 10^{18} \text{ W}$

No, the answer is incorrect.**Score: 0****Accepted Answers:** $6.17 \times 10^{16} \text{ W}$ 6) A window (consisting of a vertical sheet of plane glass) is exposed to direct sunshine at a strength of $1000 \text{ W}/\text{m}^2$. The window is pointing due south, while the sun is in the southwest, 30° above the horizon. Estimate the amount of solar energy in W/m^2 reflected by the window. Assume glass to be gray with $\rho=0.08$. **1 point**

- 612.4
- 49.0
- 707.1
- 1000

No, the answer is incorrect.**Score: 0****Accepted Answers:**

49.0

7) A diffusely emitting surface at 500 K has a spectral, directional emittance that can be approximated by 0.5 in the range $0 < \lambda < 5 \mu\text{m}$ and 0.3 for $\lambda > 5$. The total, hemispherical emittance of this surface surrounded by air is **1 point**

- 0.3103
- 0.3323
- 0.5023
- 0.5525

No, the answer is incorrect.**Score: 0**

Accepted Answers:

0.3323

8) The solid angle subtended by 1/8th part of a sphere at its center is

1 point

- $\pi/8$
- $\pi/4$
- $\pi/2$
- $\pi/6$

No, the answer is incorrect.**Score: 0****Accepted Answers:** $\pi/2$ 9) A metal ($n_2=50-50i$) is coated with a dielectric ($n_1=2-0i$), which is exposed to vacuum. The normal reflectance of the dielectric-metal interface is**1 point**

- 0
- 0.852
- 0.923
- 1.0

No, the answer is incorrect.**Score: 0****Accepted Answers:**

0.923

10) A satellite orbiting Earth has a part surfaces coated with spectrally selective "Black nickel", which is diffuse emitter with spectral emissivity given as

1 point

$$\epsilon_\lambda = \begin{cases} 0.9 & \lambda < 2 \mu\text{m} \\ 0.25 & \lambda > 2 \mu\text{m} \end{cases}$$

If the coated surface is exposed to solar irradiation (1353 W/m^2) normal to the surface, the normal absorptivity of the surface is

- 0.25
- 0.65
- 0.86
- 0.90

No, the answer is incorrect.**Score: 0****Accepted Answers:**

0.86

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