



KERALA AGRICULTURAL UNIVERSITY
B. Tech. (Agrl. Engg.) 2021 Admission
IV Semester Final Examination – July 2023

Fape.2203

Heat and Mass Transfer (2+0)

Marks: 50

Time: 2 hours

I Fill in the blanks (10x1=10)

1. Heat transfer takes place according to the law of thermodynamics.
2. As the temperature increases, the thermal conductivity of a gas
3. The temperature distribution across a slab for conduction heat transfer is
4. The Reynolds number is ratio of inertial force to
5. A radiation shield should have reflectivity

State True or False

6. An increase in convection coefficient over a fin will increase effectiveness.
7. Fouling factor increases with increasing velocity and decreasing temperature.
8. NTU means number of transfer unit.
9. Intensity of radiation is ratio of the radiant energy emitted by the body under consideration to that emitted by a black body at the same temperature.
10. Mass transfer is due to concentration gradient.

II Write short notes on ANY FIVE of the following (5x2=10)

1. Define the term conduction.
2. Define the term Heat-transfer coefficient.
3. What is thermal diffusivity?
4. State Stefan Boltzmann law.
5. Write any three non-dimensional number used in free convection.
6. Define emissivity.
7. Define the term effectiveness of heat exchanger.

III Answer ANY FIVE of the following (5x4=20)

1. What is the purpose of critical thickness of insulation?
2. Explain the concept of electrical analogy in heat transfer.
3. Difference between thermal conductivity and thermal diffusivity.
4. A heat flux meter on the outside surface of a wall shows 10 W/m^2 . The wall is 0.2 m thick and conductivity is 1.5 W/mK . Determine the temperature drop through the wall.
5. Define heat exchanger and classify the various types of heat exchanger.
6. The forced convection heat-transfer coefficient for a hot fluid flowing over a cold surface is $230 \text{ W/m}^2 \text{ K}$. The fluid temperature upstream of the cold surface is 120°C and the surface is held at 10°C . Determine the heat flux from the fluid to the surface.
7. What is mass transfer and state the Fick's law of diffusion?

IV Write an essay on ANY ONE of the following (1x10=10)

1. Write down the various mode of heat transfer, explain in detail with its law.
2. A pipe carrying steam at 230°C has an internal diameter of 12 cm and the pipe thickness is 7.5 mm. The conductivity of the pipe material is 49 W/mK the convective heat transfer coefficient on the inside is $85 \text{ W/m}^2\text{K}$. The pipe is insulated by two layers of insulation one of 5 cm thickness of conductivity 0.15 W/mK and over it another 5 cm thickness of conductivity 0.48 W/mK . The outside is exposed to air at 35°C with a convection coefficient of $18 \text{ W/m}^2\text{K}$. Determine the heat loss for 5 m length.
