KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Food Technology) 2023 Admission
III Semester Final Examination – January 2025

Pafe.2115 **Heat and Mass Transfer in Food Processing (2+1)** **Marks: 50**
Time: 2 hours

I **Fill in the blanks** **(10x1=10)**

1. Transmission of energy from one region to another because of Temperature gradient is known as .....
2. The ratio of the fin heat transfer rate to the heat transfer rate with out fin is known as .....
3. Thermal conductivity of air with rise in temperature .....
4. ..... Number is relevant in transient heat conduction
5. All radiation in a black body is.....

State True or False

6. The free convection heat transfer is significantly affected by Reynolds number
7. Compared to parallel flow heat exchanger LMTD in case of counter flow heat exchanger is Higher.
8. A gray body reflects entire radiation incident on it.
9. Schmidt number is associated with mass transfer.
10. Diffusion is faster than convective mass transfer.

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

1. Write a short note on different modes of heat transfer.
2. Discuss various parameters affecting the thermal conductivity of solids.
3. Write the assumptions used for Fourier's law of heat conduction.
4. Discuss fouling in the heat exchanger.
5. Write down the expression of LMTD for counter-flow heat exchanger.
6. List the factors affecting the rate of emission of radiation by a body exchange between two surfaces.
7. What do you mean by equimolar counter diffusion?

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

1. Consider a slab of thickness L=0.25 m. One surface is kept at 100°C and the other surface at 0°C. Determine the net flux across the slab if the slab is made from pure copper. Thermal conductivity of copper may be taken as 387.6 W/m.K.
2. What are the common failures in heat exchangers?
3. Write down the empirical correlation for free convection in vertical plate.
4. State the Stefan-Boltzmann law and Kirchhoff's law.
5. Explain Film condensation.
6. Derive steady state diffusion through a plane membrane.
7. Define Emissivity, Absorptivity, Reflectivity and Transmissivity.

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

1. Derive expression for conduction of heat through hollow cylinder
2. The flow rates of hot and cold water streams running through a parallel flow heat exchanger are 0.2kg/s and 0.5 kg/s respectively. The inlet temperature on the hot and cold sides are 75 °C and 20 °C respectively. The exit temperature of hot water is 45 °C. If the individual heat transfer coefficients on both sides are 650W/m^2 °C. Calculate the LMTD of the heat exchanger

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