53 (FPT 503) FPEN

2019

FOOD PROCESS ENGINEERING

Paper : FPT 503

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* The air to be used in a dryer at a dry-bulb temperature (DBT) of 26.6°*C* and wet-bulb temperature (WBT) of 21.1°*C* is heated to 71.1°*C* and blown into the dryer. In the dryer it cools along an adiabatic cooling line and leaves the dryer fully saturated. Find the DPT at the initial condition and other properties like absolute humidity, percentage humidity of initial air and amount of heat needed to heat 2.8 m^2/min of entering air and temperature of the air leaving the dryer. 10

Contd.

(b) In a grain dryer, one stream of air of $50 m^3/min$ at 25°C and 23°C WBT is mixed with another air stream of $50 m^3/min$ at 60°C DBT and 52°C WBT.

Determine the DBT and WBT of the mixture. 10

2. (a) Calculate the equilibrium moisture content of brinjal seed at relative humidity (RH) of 10% and temperature of 50°C using Henderson's equation. 10

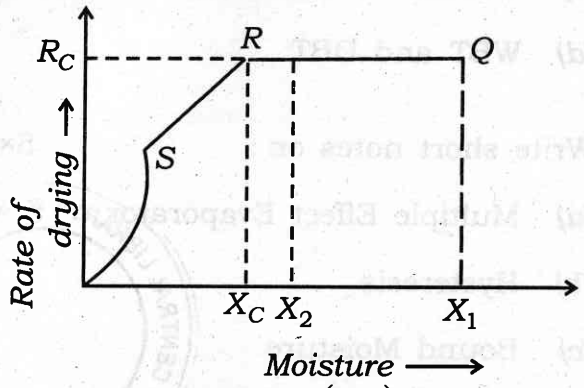
Given:

Constant, $C = 6.5 \times 10^{-6}$

and $n = 1.8$

(b) 500 kg of parboiled paddy is to be dried from 32% moisture content (wet basis) to 13% moisture content (wet basis). Calculate the amount of moisture to be evaporated. 10

3. (a) A batch drying process of 100 kg Food Powder whose drying curve is represented by following figure is dried from 28% moisture content (WB) to 16% moisture content (WB) at a constant rate of $0.006 kg/m^2 s$. The critical moisture content is 15%. Estimate the batch drying time, if drying surface is $0.03 m^2/kg$ of dry weight. 10



$X_1 = 28\%$ WB

$X_2 = 16\%$ WB

$X_C = 15$ WB

$R_C = 0.006$ kg water$/m^2 s$

(b) What is meant by constant rate period and falling rate period? Why do they occur in drying process?

Discuss various types of advanced drying techniques. 7+3=10

4. Differentiate the following: 5×4=20

(a) Humidification and dehumidification processes

(b) Mixing and Non-mixing type dryer

(c) Distillation and Dehydration

(d) WBT and DBT

5. Write short notes on : 5×4=20

(a) Multiple Effect Evaporator

(b) Hysteresis

(c) Bound Moisture

(d) Drum Dryer.

6. (a) What do you mean by EMC ? Write down the different models associated with EMC of agricultural products. 10

(b) With neat labelled diagram, discuss Falling film evaporator. 10

7. (a) What is meant by Filter aid ? Why is it used in filtration process ? 10

(b) Write a short note on Evaporative Cooling. 10
