53 (FPT 503) FPEN

2018

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)* What is a drying rate curve? 5

   (b) What is meant by Constant-rate period and Falling-rate period? Why do they occur in drying process? 10

   (c) What are various types of advanced drying techniques? 5

2. *(a)* How evaporation is diffrent from distillation and drying? 5

   (b) What is meant by a Multiple-effect evaporator? 10

   (c) Describe a Short-tube evaporator system with a neat diagram. 5

3. *(a)* $180 m^3/h$ of a steam of moist air at 15° DBT (Dry-bulb temperature) and $20°C$ WBT (Wet-bulb temperature) are mixed with $720 m^3/h$ of second steam at $15°C$ DBT and 50% RH (Relative Humidity). Barometric Pressure is 1 standard atmosphere. Determine DBT and WBT of resultant mixture. 10

(b) The humidity ratio of atmospheric air at $25°C$ DBT and $101.32 kPa$ is $0.012 kg/kg$ of dry air.

Determine :

(i) Relative Humidity (RH)

(ii) Degree of Saturation

(iii) Humid Volume.

(Data given : Partial pressue of Water Vapor – $0.019 bar$).

→ Dew point temp. – $17°C$

→ Saturation Pressure of Vapor – $0.032 bar$). 10

4. *(a)* How a humidification of air is done ? 5

(b) Describe a relationship between relative humidity and percentage humidity. 5

(c) With neat diagram, discuss typical humidification equipment. 5

(d) What are the various applications of humidification operations in food processing ? 5

5. *(a)* Two tonnes of paddy with 22% moisture content on wet basis are to be dried to 12% moisture content on dry basis. Calculate the weight of bone dry products and water evaporated. 10

(b) Determine the values of C and n from Hendenson's equation for the following data : 10

	RH	Temp	M_e
Sample - 1	40%	$60°C$	8.65%
Sample - 2	80%	$50°C$	14.62%

6. Write short notes on : 5×4=20

(a) Hysteresis effect

(b) Dewpoint Temperature

(c) Cabinet Dryer

(d) Hammer Mill

(e) Calandria Evaporator.

7. Differentiate the following : 5×4=20

(a) Bound Moisture Content and Unbound Moisture Content

(b) Thin-layer drying and Deep-bed drying

(c) Humidification and Dehumidification process

(d) Drying and Dehydration

(e) Rising film evaporator and Falling film evaporator.