53 (FPT 503) FPEN

2017

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 do you mean by 'EMC' ? Write down the different models associated with EMC of agricultural products.

   Discuss importance of EMC. 10

   (b) Calculate the equilibrium moisture content of brinjal seed at relative humidity (RH) of 10% and temperature of 50°*C* using Henderson's equation. Given that constant '*c*' → $6{\cdot}5\times10^{-6}$

   '*n*' → 1·8

   10

2. *(a)* Define the term 'Moisture Content'. Discuss different types of moisture with suitable diagram. 10

(b) Determine the quantity of rice (parboiled) with 40% moisture content on wet basis required to produce 1 ton of product with 12% moisture content on wet basis. Workout the problem on wet basis and check the answer using dry basis. 10

3. *(a)* Describe a Pschrometric chart. What are the various applications of humidification operations in Food Processing ? How de-humidification of air is done ? 10

(b) The humidity ratio of atmospheric air at 25°*C* dry bulb temperature (dbt) and 101·32*kPa* is 0·012*kg/kg* of dry air. Determine

(i) Relative humidity

(ii) Degree of saturation

(iii) Humid volume of air

(iv) Enthalpy of mixture

(v) Dew point temperature.

Given partial pressure of water vapour = 0·019 *bar* and partial pressure of water vapour at saturation = 0·032 *bar*. 10

4. (a) What is meant by dehydration ? Describe briefly the principles of drying. What are the parameters of foods that determine the drying characteristics ? 10

(b) Describe with a neat diagram a drumdryer and its application in food processing. 10

5. (a) How evaporation is different from distillation and drying ? What are various components of an evaporator ? 10

(b) Describe a falling film evaporator system with a neat diagram. 10

6. (a) Describe the process of filtration as a unit operation for separation of suspended solids. What are the desirable characteristics of a filter medium ? 10

(b) A vitamin premix is blended with a fermentation broth in a 1 litre agitated tank and is agitated by a standard Rushton type turbine impeller. The vessel geometry is as per standard description. The impeller has six (06) blades, and is rotating at $10 rps$. The fluid viscosity is $80 cp$ and its density is $1050 kg/m^3$. Calculate the power required to run the impeller. (Given $N_{po} - 3{\cdot}5$) 10

7. Write short notes on : 5×4=20

(i) Rotary dryer

(ii) Reverse Osmosis

(iii) Cooling tower (Psychrometrics)

(iv) Hystersis effect

(v) Multiple-effect evaporator.
