

KERALA AGRICULTURAL UNIVERSITY

B.Tech (Food.Engg) 2011 Admission
VIth Semester Final Examination- July -2014

Cat. No: Fden.3209

Marks: 80

Title: Food Process Equipment Design and Plant Layout (1+1)

Time: 3 hours

Part A

Answer the following

(10 × 1.0 =10.0)

Fill up the blanks

1. When water is frozen, its volume increases approximately by _____.
2. Ice is _____ to vapour in freeze dryer.
3. Gear drive transmits _____% power.
4. The presence of solutes _____ the freezing point.
5. The end product of evaporation is _____
6. In spray dryer, _____ converts the continuous flow of food into droplets.
7. During rapid freezing, the size of ice crystals formed is _____
8. Wet basis moisture content is always _____ dry basis moisture content.
9. The heat transfer surface of an evaporator is called _____
10. In cyclone separators, the feed flow enters _____ to the cone diameter.

Part B

Answer any TEN of the following

(10 × 3.0 =30.0)

Write short note on

1. pressure vessel
2. homogenizer
3. freezer
4. heat exchanger
5. single effect evaporator
6. twin screw extruder
7. critical load
8. economic plant size
9. vacuum evaporator
10. site selection
11. spray dryer
12. sterilizer

Part C

Answer any SIX questions

(6 × 5.0 =30.0)

1. Explain application of engineering principles in food processing equipment design.
2. Write about the design parameters for heat exchangers.
3. Design a freezer for freezing one tonnes of meat product from a temperature of 32°C to -40°C. Make valid assumptions wherever necessary.
4. Write a detailed note on installation procedure for food processing plant layout.
5. What are the major factors affecting the food deterioration?
6. Explain equipments for packing of food.
7. Derive an expression for enthalpy balance in multiple effect evaporators.

Part D

Answer any ONE question

(1 × 10.0 =10.0)

1. A single effect evaporator is to be designed to concentrate 10000 kg/h of a juice from 10 % to 20 % solids by weight. Feed enters at 30°C. Saturated steam at 110°C (latent heat 540 kcal/kg) is available. Condensate leaves at saturation temperature. The juice boils at 45°C (L.H. 570 kcal/kg). Overall heat transfer coefficient may be taken as 1800 kcal/h m² °C. Calculate (i) Steam consumption, kg/h (ii) Heat transfer area.
2. Wheat weighing 900 kg/m³ is loaded in a circular concrete silo of 3m internal diameter and clear height of 8 m. The angle of internal friction for wheat is 25° and that for wheat and concrete is 24°. Applying Airy theory, calculate the maximum lateral pressure at the centre and the bottom of bin section

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