

Ref. No.: EX/PG/FTBE/T/113C/17/2017

M.TECH(F.T.B.E) 1 ST SEMESTER EXAMINATION- 2017

DAIRY ENGINEERING Time: 3hrs Full Marks: 100

Use Separate Answer Script for each Part

(50 marks for each part)

PART- I

Answer question 1 and any two from the rest.

1. Explain the following: 4 X 5

- a) Soft curd milk
- b) Milk carbohydrate and milk fat
- c) Salt balance of milk
- d) Capacity and efficiency of drum drier

2. a) What is pasteurization? What is HTST pasteurization? Differentiate between pasteurization and sterilization 1.5 +1.5 +2

b) Milk is pasteurized in a HTST unit using regenerator at a rate of 2000 kg/h using counter flow plate heat exchanger. The raw milk inlet temperature is 72° C, the effectiveness of the regenerator is 0.75 and overall heat transfer co-efficient is 2000 kcal/hm²°C. Initial temperature of milk is 4° C. given sp heat of milk is 0.93 kcal/kg ° C, find out- (a) Amount of saving in steam (kg) and refrigeration (tonnes) by using the regenerator (b) Heat transfer area required to get the above effectiveness (c) If the effectiveness is to be 0.8, what would be the overall heat transfer co-efficient? 10

3. a) Comment on 5
Function of ice cream freezer, Factors influencing freezing time, Dasher

b) Find out the refrigeration load of an ice cream freezer in tonnes when capacity of the freezer 700 kg/hr, drawing temperature -5°C , initial temperature of mix 4°C , initial freezing temperature of mix -2.5°C , water content of the mix 63%, sp. heat of mix 0.8, sp. heat of mix at 100% over run 0.6, % of water frozen at -5°C , 47%. Assume that 85% of the heat equivalent of the work done by the motor appears as heat in the ice cream. If the freezer requires 5kw motor to drive the dasher and radiation loss is 3% of the total.

10

4. write short notes on (any 3)

3 X 5

- a) Over run and shrinkage of ice cream
- b) Sweetened condensed milk
- c) Reconstituted milk
- d) Factors affecting composition of milk

MASTER OF TECHNOLOGY IN FOOD TECHNOLOGY &

BIOCHEMICAL ENGINEERING EXAMINATION, 2016

(1st Semester)

Dairy Engineering

Part-II

Time: Three hours

Full Marks: 100

Answer Question No. One and any two of the rest

1. Discuss how regeneration in plate heat exchanger occurs in milk industry using suitable diagram and operating parameter? What do you mean by pass? 7+3=10

2. Derive a relation between interface radius with radius of surface of fat layer and radius of surface of water layer in a tubular type cream separator.
If you need to design a 10000 lit capacity milk tank which one will you choose between cylindrical and square bottom –discuss why? 10+10=20

3. Derive an equation for minimum possible diameter for Homogenized Fat globules when
a) Phospholipids is limiting.
b) Positive pressure due to interfacial tension and negative pressure created due to shear is equal.
Double stage or single stage homogenizer which is better and why? 10+5+5=20

4. Derive a heat balance equation used for design of spray dryer.
Milk at 4⁰C is being pumped from a tank to an elevated tank at 15 m high. If frictional losses is 5.87 J/kg calculate the Horse power require for the pump? Make appropriate assumption required. Mass flow rate and density of the milk is $5 \times 10^{-3} \text{ m}^3/\text{s}$ and 930 kg/m^3 respectively. 10+10=20