



The Open University of Sri Lanka  
Faculty of Engineering Technology  
Diploma/Degree in Industrial Studies (Agriculture)  
Final Examination- 2008/2009  
**AEI6236 Food Processing**

Date : 29-03-2009  
Time : 9.30-12.30 hrs

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**SECTION II**

- (1) (a) Briefly discuss the advantages and disadvantages of cook-chill system.  
(b) Write a short note on "Type of packaging materials".
- (2) (a) Discuss the freezing on food materials and how it affects to the final consumer.  
(b) Write a short note on "Time-temperature curve during freezing
- (3) (a) Write a brief note on Pasteurization  
(b) Raw milk at 10 °C is to be pasteurized at 80 °C in a plate heat exchanger at a rate of 3500 l/h and then cooled to 4 °C. The hot water is supplied at 5000 l/h at 90 °C and chilled water has a temperature of 2 °C. Each heat exchanger plate has an available area of 0.75 m<sup>2</sup>. The overall heat transfer coefficients are calculated as 2890 Wm<sup>2</sup>K<sup>-1</sup> in the heating section, 2750 Wm<sup>2</sup>K<sup>-1</sup> in the cooling section and 2700 Wm<sup>2</sup>K<sup>-1</sup> in the regeneration section. 70% of the heat exchange is required to take place in the regeneration section. Calculate the number of plates required in each section. (all steps and diagrams are needed)

(Density of milk is 1030 kgm<sup>-3</sup>, Density of water is 958 kgm<sup>-3</sup> at 85 °C and 1000 kgm<sup>-3</sup> at 2 °C, the specific heat of water is constant at 4.2 kJkg<sup>-1</sup>K<sup>-1</sup> and the specific heat of milk is constant at 3.9 kJkg<sup>-1</sup>K<sup>-1</sup> ).

- (4) A single-effect, vertical short-tube evaporator is to be used to concentrate syrup from 15% solids to 50% solids at a rate of 150kg h<sup>-1</sup>. The feed enters at 15°C and is evaporated under a reduced pressure of 45.5 kPa (at 80°C). Steam is supplied at 169 Kpa (115°C). Calculate the quantity of steam used per hour and the number of tubes required. Assume that the boiling point remains constant and that there are no heat losses,

(Additional data: the specific heat of syrup is constant at 3960 J kg<sup>-1</sup>K<sup>-1</sup>, the specific heat of water is 4186 J kg<sup>-1</sup>K<sup>-1</sup>, the latent heat of vaporization of the syrup is 2309 J kg<sup>-1</sup>, the overall heat transfer coefficient is 2600 W m<sup>-2</sup>K<sup>-1</sup> ,the

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latent heat of steam is  $2217 \text{ kJ kg}^{-1}$  at  $115^\circ\text{C}$ , the diameter of a tube is  $2.5\text{cm}$  and the length of a tube is  $1.38\text{m}$ ).

- (5) (a) Write a short essay on the factors that control the growth of micro organism in food fermentation.  
(b) Briefly discuss the culture methods of micro organism in food fermentation
- (6) Write short notes on any three (03) of the following.
- (a) Advantages and disadvantages of irradiation
  - (b) Different types of freezing equipments
  - (c) Typical drying curve
  - (d) Effects of frying on food