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**University Examinations 2014/2015**

SECOND YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN FOOD SCIENCE AND TECHNOLOGY

**AFT 3250: FOOD ENGINEERING 1**

 **DATE: APRIL 2015 TIME: 2 HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. Define a the following terms as encountered in food engineering:
2. Thermal conductivity
3. Fo value
4. Critical moisture content
5. Blanching
6. Bulk density (5 Marks)
7. A food sample had 380% moisture contents in dry basis. Determine the moisture content in wet basis and dry matter (3 Marks)
8. A fruit pulp (1000 kg) contains 10% of suspended fruit solids. After filtration a juice and wet solids were obtained. The wet solids contained 20% moisture. Determine the amount of juice and wet solids obtained (3 Marks)
9. Differentiate between laminal and turbulent flow (2 Marks)
10. A wall of a cold storage is 20 cm thick. The outside temperature is 20oC and the inside temperature is -10oC. The mean thermal conductivity of the wall is 0.042 JM-1 S-1 OC-1. What is the rate of heat transfer through 1m2 of wall? (3 Marks)
11. Differentiate between open and closed system (2 Marks)
12. Differentiate between pasteurization and sterilization (2 Marks)
13. Although refrigeration is used to preserve food, foods still go bad discuss (3 Marks)
14. Explain why food processors are opting for non-thermal food processing technologies

 (2 Marks)

1. Briefly describe the following equipment mentioning their applications
2. Fluidized bed drier
3. Plate heat exchanger (5 Marks)

**QUESTION TWO (20 MARKS)**

1. Draw and label a typical drying rate against moisture content drying curve (8 Marks)
2. The initial moisture content of a product is 80% (wb) and the critical moisture content is 20% (wet basis). If the constant drying rate is 0.1 kg H20/m2/s. Calculate the time required for the product to begin the falling rate drying period. The product is a cube of 5 cm and product density is 950 kg/m3. (12 Marks)

**QUESTION THREE (20 MARKS)**

1. After completing your degree you are employed as a supervisor in food processing industry. The company wants to build a cold store with an outer wall of concrete (100 mm thick) and an inner wall of wood (10 mm thick) with a space in between (100 mm) filled with polyurethene form. If the inner temperature is 5oC and the outer wall is maintained at the ambient air temperature of 25oC. Calculate the rate of heat penetration and temperature at interfaces, Thermal conductivity of concrete is 0.80, insulation 0.025 and wood 0.17 (WM-1 K-1). The dimension of the wall are (2x4 metres) (15 Marks)
2. Discuss the advantages of counter current heat exchanger compared to co-current types

 (2 Marks)

1. Discuss advantages of continuous process compared to batch processing in food (3 Marks)

**QUESTION FOUR (20 MARKS)**

1. A student heated a suspension of spores at 121oC for 100 seconds and obtained a 9 log killing of spores. To achieve the same reduction at 110oC, 27.5 seconds is required. Calculate the decimal reduction time at the two temperature, the z-value, the energy of activation and the Q10 of the thermal inactivation process at their temperatures.

 (10 Marks)

1. Discuss the following equipment as used in food processing giving example of their application
2. Fluidized bed drier
3. Co-current and countercurrent heat exchanger
4. Rising film evaporator (10 Marks)