TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BSc. FOOD SCIENCE AND QUALITY ASSURANCE

AFS 4301 : **FOOD ENGINEERING 11**

SPECIAL/ SUPPLIMENTARY EXAMINATIONS

SERIES: SEPTEMBER 2018

TIME: 2 HOURS

DATE: Pick Date Sep 2018

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

a. Describe vacuum distillation (5mrks)

b. Explain the continuous pasteurization method (3mks)

c. Pineapple juice is flowing into a pipe cooler and passes through a tube of 5m internal diameter at the rate of 20Kg/s. Its initial temperature is 55^{o}C and it is wished to cool it to 20^{o}C using stirred bath at constant 10^{o}C water round the pipe. Calculate the length of pipe required, assuming overall coefficient of heat transfer from the bath to the juice of 900J/m^{2}S^{o}C and a specific heat of juice is 4200J/Kg^{o}C (5mks)

d. Explain the use of distillation in food processing (4mks)

e. Describe the operation of plate heat exchanger (5mks) .

f. Explain the following behavior, observed during dehydration of foodstuff;

i.) Movement of solubles (3mks)

ii.) Shrinkage (3mks)

g. State two advantages of immersion freezing (2 marks)

Question TWO

a. Explain the influence of the following feed liquor properties on evaporation;

i.) Viscosity (3mks)

ii.) Fouling (4mks)

iii.) Foaming (3mks)

b. Juice is concentrated from 5% to 76% soluble solids. The feed rate was 300Kg/hour at a temperature of 15˚C the juice boils at 85˚Cand has a specific heat capacity of 4.2 Kj/kgºc. The latent heat of steam and vapor produced are 1800 and 2200Kj/kg respectively. (i) Calculate the steam feed rate into the evaporator (6mks)

(ii) Determine the temperature of the steam used, given that the overall heat transfer is $900J/m^2s^oC$ and the area of heat transfer surface as $12m^2$ (4mks)

Question THREE

a. With the aid of a diagram, describe the principle of operation of the a continuous fluidized bed drier for powdered material (10mks)

b. Describe continuous-flow heat exchangers, illustrating the directions of flow of the fluids. (10mks)

Question FOUR

a. Milk is flowing into a pipe cooler and passes through a tube of 2.5 cm internal diameter at a rate of 0.4 kg s^{-1}. Its initial temperature is 49°C and it is wished to cool it to 18°C

using a stirred bath of constant 10°C water round the pipe. Calculate the length of pipe required. Assume an overall coefficient of heat transfer from the bath to the milk of 900 J m^{-2} s^{-1} $°C^{-1}$, and that the specific heat of milk is 3890 J kg^{-1} $°C^{-1}$. (10 mks)

b. Discuss chilling of food as preservation method in the industry (10mks)

Question FIVE

Describe the following methods of freezing, stating advantages where possible;

a.) Cryogenic (two-phase) freezing (7mks)

b.) Plate freezing (6mks)

c.) Air Blast freezing (7mks)