CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

RESIT/SPECIAL

EXAMINATIONS FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN FOOD SCIENCE AND TECHNOLOGY

FOST 131: FUNDAMENTALS OF FOOD PROCESS ENGINEERING I

STREAMS: BSC (FOST) Y1S2   **TIME: 2 HOURS**

DAY/DATE: TUESDAY 02/02/2021   **8.30 A.M. – 10.30 A.M.**

INSTRUCTIONS: Answer ALL Questions in section A and ANY other TWO Questions in section B

SECTION A

1. i) Use a clearly labeled diagram to explain the terms; system, boundary and surroundings.

    (5 marks)

    ii) Define Viscosity.   (2 marks)

2. Distinguish between an adiabatic system and an isothermal system.   (2 marks)

3. A tubular water blancher is being used to process Lima beams. The product mass flow rate is   860 kg/h. It is found that the theoretical energy consumed for the blanching process amounts to 1.19 GJ/h. The energy lost due to lack of insulation around the blancher is estimated to be 0.24 GJ/h. If the total energy input to the blancher is 2.71 GJ/h,

    i.) Calculate the energy required to reheat water.   (5 marks)

    ii.) Determine the percent energy associated with each stream.   (3 marks)

4. (i) Enumerate advantages offered by Plate heat exchangers.   (5 marks)

    (ii) Differentiate between Steady-state and unsteady-state heat transfer conditions.

    (2 marks)

5.   Name and use a diagram(s) to illustrate three types of liquid flow characteristics.

(6 marks)

SECTION B

6.   a) State and explain the second law of thermodynamics. Give examples.   (10 marks)

b) Use a diagram of shear stress vs shear rate to illustrate how different liquids behave under increased shear stress. Explain.   (10 marks)

7.   Discuss the following modes of heat transfer;

(i) Conductive Heat Transfer   (8 marks)

(ii) Convective Heat Transfer   (7 marks)

(iii) Radiation Heat Transfer   (5 marks)

8.   There are numerous types of pumps used in the food industry. Classify them and explain variations within each of these types.   (20 marks)