**CHUKA**  **UNIVERSITY**



**UNIVERSITY EXAMINATION**
**RESIT/SUPPLEMENTARY / SPECIAL EXAMINATIONS**
**EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN FOOD SCIENCE AND TECHNOLOGY**

**FOST 232: FUNDAMENTALS OF FOOD ENGINEERING II**

**STREAMS:** **TIME: 2 HOURS**

**DAY/DATE: WEDNESDAY 03/11/2021** **2.30 P.M - 4.30 P.M.**

**INSTRUCTION TO THE CANDIDATE**

**Answer ALL Questions in section A and ANY other TWO Questions in section B**

**SECTION A**

1. List the advantages and limitations of abrasion peeling method. (5 marks)

2. a) Explain the benefits conferred by size reduction in food processing. (5 marks)

b) The partial pressure of water vapour in a storage area, maintained at a temperature of $25^0$C and a pressure of 101.3 kPa, is 2kPa. Calculate the relative humidity and percentage saturation. At $25^0$C the pure component vapour pressure of water (i.e $P_{wo}$) is 3.166 kPa. (5 marks)

3. State and explain Kick's law. (5 marks)

4. Explain the term mixing and classify types of mixers. (5 marks)

5. A bowl centrifuge is used to break an oil-in-water emulsion. Determine the radius of the neutral zone in order to position the feed pipe correctly. (Assume that the density of the continuous phase is 1000 kg $m^{-3}$ and the density of the oil is 870 kg $m^{-3}$. The outlet radii from the centrifuge are 3 cm and 4.5 cm.) (5 marks)

**SECTION B**

6. (a) Describe extrusion as a method of food processing and give reasons why it has gained in popularity. (14 marks)

b) Explain the factors which influence the time required for solvent extraction. (6 marks)

7. a) Differentiate ball mills, hammer mills and roller mills based on their mode of operation. (9 marks)

b) Enumerate the main advantages and problems associated with using irradiation as a method of food processing and preservation. (11 marks)

8. (a) Beer with a specific gravity of 1.042 and a viscosity of $1.40 \times 10^{-3}$ N s $m^{-2}$ contains 1.5% solids which have a density of 1160 kg $m^{-3}$. It is clarified at the rate of 240 l $h^{-1}$ in a bowl centrifuge which has an operating volume of 0.09 $m^3$ and a speed of 10 000 rev $min^{-1}$. The bowl has a diameter of 5.5 cm and is fitted with a 4 cm outlet. Calculate the effect on feed rate of an increase in bowl speed to 15 000 rev $min^{-1}$ and the minimum rev particle size that can be removed at the higher speed. (10 marks)

b) Discuss the factors which influence the rate of heat penetration into a food during heat sterilization. (10 marks)

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