2913/205
FOOD ENGINEERING II
Oct./Nov. 2022
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN FOOD SCIENCE AND PROCESSING TECHNOLOGY

MODULE II

FOOD ENGINEERING II

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
Answer booklet;
Non-programmable scientific calculator.
*This paper consists of **TWO** sections; **A** and **B**.*
*Answer **ALL** the questions in section **A** and any **TWO** questions from section **B** in the answer booklet provided.*
*Each question in section **A** carries **15** marks while each question in section **B** carries **20** marks.*
Maximum marks for each part of a question are as shown.
Candidates should answer the questions in English.

This paper consists of 4 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

SECTION A (60 marks)

*Answer **ALL** the questions in this section.*

1. (a) Name **four** types of surfaces used for making screens in the food industry. (4 marks)

   (b) Explain **three** factors considered when choosing the type of screen for use in the food industry. (6 marks)

   (c) Describe the use of reels in the food industry. (5 marks)

2. (a) (i) Draw a graph describing constant pressure filtration on cartesian of volume of filtrate against time of filtration. (2 marks)

   (ii) Explain the shape of the graph in (i) above. (4 marks)

   (b) Differentiate between pressure filters and vacuum filters. (4 marks)

   (c) State **five** applications of filters in the food industry. (5 marks)

3. (a) Explain the principle of separation of skim milk and cream using a tubular bowl centrifuge. (5 marks)

   (b) Define each of the following terms as used in centrifugation:

   (i) clarification; (2 marks)

   (ii) desludging. (2 marks)

   (c) Explain **three** operational requirements for membranes suitable for reverse osmosis in food processing industry. (6 marks)

4. (a) State **five** applications of solid mixers in the food industry. (5 marks)

   (b) With the aid of a diagram, describe the mode of action of emulsifying agents in food emulsions. (7 marks)

   (c) Explain the unstable nature of mayonnaise. (3 marks)

SECTION B (40 marks)

*Answer any **TWO** questions from this section.*

5. (a) Describe **three** methods used to reduce the effects of rotational movement in mixing of low viscosity liquids. (6 marks)

(b) Explain how each of the following material properties influence the degree of 'mixedness' of solids with other materials:

(i) solubility; (2 marks)
(ii) shape; (2 marks)
(iii) density; (2 marks)
(iv) moisture content; (2 marks)
(v) size. (2 marks)

(c) Differentiate between segregating mixers and non-segregating mixers. (4 marks)

6. (a) Identify the type of emulsion likely to be formed under the following conditions:

(i) the emulsifying agent is more soluble in the aqueous phase. (1 mark)
(ii) aqueous phase is added to the oil phase as agitation is done. (1 mark)
(iii) higher quantity of the oil phase than the aqueous phase. (1 mark)
(iv) solid particles used as emulsifying agents easily wetted by the water phase. (1 mark)

(b) Describe **four** steps involved in the production of fine emulsions. (8 marks)

(c) With an example of a wedge resonator, explain the application of ultrasonic emulsification devices in the food industry. (8 marks)

7. (a) Describe **two** methods of applying filter aid to the filter. (6 marks)

(b) State **four** objectives of filtration in the beer making process. (4 marks)

(c) State **five** applications of centrifugation in the food industry. (5 marks)

(d) A small disc of 30 cm in diameter rotates at 6,400 rev/minute. Calculate the speed of rotation required for a disc measuring 1.5 m in diameter to produce equal centrifugal force for the same solid particle. (5 marks)

8. (a) State **five** qualities of a solvent used in the extraction of oil from vegetable seeds. (5 marks)

(b) Explain the influence of each of the following factors on the rate of extraction during solid-liquid extraction:

(i) temperature; (3 marks)
(ii) size of solid particles; (3 marks)
(iii) concentration gradient. (2 marks)

(c) With the aid of a labelled diagram, explain the use of roller press in the food industry. (7 marks)

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