

2913/205
FOOD ENGINEERING II
June/July 2021
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 indicated.

Candidates should answer the questions in English.

This paper consists of 3 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) Define each of the following terms:
- (i) filtration; (2 marks)
 - (ii) prefilt. (2 marks)
- (b) State five qualities of a good filter medium for use in the food processing industry. (5 marks)
- (c) Explain the application of filter aids. (6 marks)
2. (a) Explain the principle of separation of immiscible liquids by centrifugation. (4 marks)
- (b) Calculate the centrifugal force experienced by a sphere held inside rotating bowl centrifuge whose radius is 15 cm and speed is 30 rev/sec, given that the density of the sphere is 2.5 g/cm³ and its volume is 10 cm³. (6 marks)
- (c) State five applications of centrifugation in the food processing industry. (5 marks)
3. (a) With the aid of labelled diagrams, describe the possible major types of emulsion formed in the mixing of oil and water. (6 marks)
- (b) Explain the importance of emulsifying agents. (5 marks)
- (c) Explain the steps involved in the production of an emulsion. (4 marks)
4. (a) Explain three factors which influence the degree of uniformity achieved in the mixing of dry solids. (6 marks)
- (b) State three areas of application of continuous paste mixers. (3 marks)
- (c) Compare the sizes and the rotation speed of the three types of impeller mixers for low viscosity liquids. (6 marks)

SECTION B (40 marks)

Answer any TWO questions from this section.

5. (a) Define concentration polarisation. (3 marks)
- (b) State **four** advantages of membrane separation over other methods of concentration of solutions. (4 marks)
- (c) State **four** limitations of cellulose acetate material in making of membrane for reverse osmosis. (4 marks)
- (d) With the aid of a labelled diagram, describe the recirculation system in reverse osmosis. (9 marks)
6. (a) Explain **five** factors which influence the efficiency of a screening operation. (10 marks)
- (b) Explain the effects of temperature on the rate of extraction of sugar from sugarcane. (4 marks)
- (c) Oil from 50 kg of soya bean is extracted in a continuous counter current system using hexane as a solvent. The oil content of the soya beans is 20% and 90% of this oil is to be extracted. The final oil concentration of the solution from the extraction cells (miscella) is 45%. Given that the solids retain 40% of their weight of solution, calculate the amount of hexane used in the extraction process. (6 marks)
7. (a) State **three** advantages and **two** disadvantages of the continuous rotary drum vacuum filters. (5 marks)
- (b) Differentiate between constant rate filtration and constant pressure filtration. (4 marks)
- (c) With the aid of a diagram, describe the operation of a Hilder brand extractor. (11 marks)
8. (a) (i) Define critical speed of a trommel. (2 marks)
- (ii) Calculate the critical speed of a trommel whose radius is 18 cm. (3 marks)
- (b) Explain the application of a static inline mixer for pastes. (5 marks)
- (c) With the aid of a graph, differentiate between thorough washing and displacement washing of filter cake. (10 marks)

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