2913/105
FOOD ENGINEERING I
June/July 2020
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN FOOD SCIENCE AND PROCESSING TECHNOLOGY

MODULE I

FOOD ENGINEERING I

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 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.

   Turn over

SECTION A (60 marks)

Answer ALL questions in this section.

1.   (a)   Define a conveyor.   (1 mark)

     (b)   Describe the operation of a screw conveyor.   (4 marks)

     (c)   Explain the qualities required of material used for construction of food processing plant equipment.   (10 marks)

2.   (a)   Name the different types of forces experienced during size reduction of dry solid food material.   (3 marks)

     (b)   The energy required to reduce particles of a food raw material from a mean diameter of 1.0 cm to 0.3 cm is 11 kJ/kg. Calculate the energy required to reduce the same particles from a diameter of 0.1 cm to 0.01 cm assuming the following laws apply:

        (i)   Kick's law;   (3 marks)
        (ii)   Rittinger's law.   (3 marks)

     (c)   Explain **three** emergency utilities in a food processing plant.   (6 marks)

3.   (a)   Describe the quality indices considered in determining the suitability of food raw materials for processing.   (4 marks)

     (b)   State **five** factors which affect the efficiency of spray washing.   (5 marks)

     (c)   Explain the disadvantages of using quaternary ammonium compounds (QACs) in spray drum washing.   (6 marks)

4.   (a)   Explain the purpose for storing raw water prior to treatment.   (6 marks)

     (b)   Describe the different types of contaminants targeted in the treatment of boiler feed water.   (4 marks)

     (c)   Explain the importance of stirring in sedimentation process of water treatment using floculants.   (5 marks)

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

5. (a) Explain **four** reasons for reducing biological oxygen demand (BOD) of wastewater from food processing plants before disposal. (8 marks)

   (b) Describe the operation of lagoons in waste treatment. (12 marks)

6. Explain the hygienic design, construction and layout of a food processing plant with respect to the following:

   (a) roof span and supporting pillars; (3 marks)

   (b) walls and ceilings; (6 marks)

   (c) floors; (6 marks)

   (d) ventilation; (3 marks)

   (e) lighting. (2 marks)

7. (a) Explain **six** factors considered when choosing the location of a food processing factory. (12 marks)

   (b) Describe **four** hazards in a food processing plant. (8 marks)

8. Describe the operation of each of the following comminution equipment:

   (a) Crushing rolls; (5 marks)

   (b) Hammer mill; (5 marks)

   (c) Bǔhr mill; (5 marks)

   (d) Ball mill. (5 marks)

THIS IS THE LAST PRINTED PAGE.