UNIVERSITY OF GHANA

BSC ENGINEERING FIRST SEMESTER EXAMINATIONS: 2016-2017
DEPARTMENT OF FOOD PROCESS ENGINEERING

FPEN 405: ENGINEERING AND DESIGN OF FOOD PROCESSES III: PLANT PRODUCTS
(3 CREDITS)

INSTRUCTIONS:
ANSWER FIVE QUESTIONS, AT LEAST TWO FROM EACH SECTION

TIME ALLOWED THREE (3) HOURS.

SECTION A
(Use separate answer book)

1.
   a. Thermoplastic extrusion is a high-temperature, short-time process or method of cooking. What are the design features and advantages of this technology? In designing the process distinguish your decision as an engineer in selecting a particular configuration of screws.
   b. What are the critical operations in the production of ready-to-eat (RTE) cereals? Compare and contrast their process characteristics

2. You have been employed as the food process engineer by the Ministry of Trade and Industry to oversee the expansion of the Bawjiase cassava processing plant to include the production of gari, agbelima and cassava chips. Discuss their process characteristics for each product and any design challenges likely to confront you in the plant.

3.
   a. Solvent extraction with hexane is the standard practice in today's modern oilseed-processing facilities. With the aid of a flow diagram describe a typical process delineating the merits and demerits.

b. Public concerns and government scrutiny about the environmental and human health hazards of organic solvents and residues in oilseed-derived products catalyzed the search for alternative solvents and technology for the production of edible oils. Apart from the simple indigenous methods, discuss the options you have to address this problem as an engineer, giving reasons.

4. You have been appointed as the District Food Process Engineer in the Dangbe East District. Two adjacent communities known to grow pepper and cassava will like to dry the fresh produce for the market using a solar drier. If you are to design this drier for the community show, with appropriate diagrams, the design features and how you will assess the efficiency of the drier.

SECTION B

(Use separate answer book)

5.

a. Cleaning and sorting are important unit operations in the processing of fruits and vegetables. Using two specific examples, describe the objectives of these operations and how they can be successfully achieved in a processing facility.

b. The processing of cereals into kenkey involves key unit operations responsible for specific quality characteristics in the product. Select and describe any three of these unit operations and propose improvements related to process efficiency and hygiene.

6. In order to gain additional revenue from the sale of cocoa beans, the Government of Ghana is implementing a new policy to promote value addition to cocoa beans intended for export. As the Consultant Food Process Engineer, design a process that can be used to transform raw cocoa beans into three (3) unique products. Your write-up should include detailed flow diagrams, list of key equipment and descriptions of key unit operations.

7. The production of tomatoes are generally associated with high losses due to ineffective post-harvest management practices. You have been hired to assist a cooperative of tomato processors who currently use purely manual methods to process tomato paste. Describe in detail a modern tomato paste process that you can propose to upgrade their current processes.

8. Briefly describe the following
   a. Processing of powder and oleoresin from chillies.
   b. Tempering and milling as unit operations in wheat processing.
   c. Any three options available for concentration of fruit juices.