UNIVERSITY OF GHANA

BSC. ENGINEERING FIRST SEMESTER EXAMINATIONS: 2016/2017

DEPARTMENT OF FOOD PROCESS ENGINEERING

FPEN 407: STATISTICAL QUALITY CONTROL IN FOOD PROCESSING
(2 Credits)

INSTRUCTIONS: ***ANSWER QUESTION ONE AND ANY OTHER THREE QUESTIONS. GRAPH SHEETS AND STATISTICAL TABLES ARE AVAILABLE AS NEEDED.***

TIME ALLOWED: ***TWO (2) HOURS***

1. Party Tuna Company purchases 1,000 packaging pouches every month from local vendors to be used in its packaging process. The Quality Assurance Department is responsible for inspecting the incoming pouches and accepting or rejecting the lot. The QA Dept. wants to develop the sampling plan for the inspection process using the following options.
   i. Inspect 10 randomly selected pouches, accept if max two pouches are defective.
   ii. Inspect 20 randomly selected pouches, accept if max two pouches are defective.
   iii. Inspect 30 randomly selected pouches, accept if max two pouches are defective.

   a. Determine the probability of accepting lots with 1%, 5%, 10%, 15%, 20%, 25%, 30% and 40% defects under each sampling plan.
   b. Draw Operating Characteristics (OC) curves for the three (3) sampling plans using the information in (a) above.
   c. Explain the effect of increasing the sample size on the probability of acceptance of a lot.

2.
   a. It is generally agreed that there is no universal definition for quality. Discuss any four (4) of the commonly accepted definitions of quality.
   b. Differentiate between the following
      i. Categories of cost of quality
      ii. Causes of variation
      iii. Codex Standards and Industry Standards
      iv. Non-conforming units and non-conformities

Explain how the DMAIC cycle is used for Process Improvement.

The Breeze Chocolate Company is investigating a leakage problem with its sachets of chocolate spread. The product is packed in cartons each containing 50 sachets of chocolate spread. Fifteen (15) cartons of chocolate spread were sampled and the number of leaking sachets found per carton is recorded in the table below. Develop a p-chart with 3-sigma control limits and explain whether or not the process is in statistical control.

Sample No	Number of Leaky Sachets	Sample No	Number of Leaky Sachets	Sample No	Number of Leaky Sachets
1	12	6	7	11	13
2	15	7	16	12	6
3	8	8	9	13	17
4	10	9	14	14	10
5	14	10	10	15	20

4. The Fraiche Juice Company is evaluating the process capability of their filling process for pineapple juice. The process is designed to fill 300ml of pineapple juice with an upper specification limit of 325 ml and a lower specification limit of 275ml. The actual packaging process results in bottles with an average net volume of 293ml and a standard deviation of 6.4ml.

   a. Calculate the process capability indices, C_p and C_{pk}.
   b. Is the process capable of meeting design specifications? Explain your answer.

5.

   a. The Dimensions of Quality can be used to assess quality characteristics of products. Discuss any five of the dimensions of quality.
   b. Explain the concept and application of Acceptance Sampling. Use specific examples to illustrate your answer.
   c. Briefly comment on the reasons why implementation of Total Quality Management (TQM) might not be successful.