UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2021/2022

COURSE NAME	:	INDUSTRIAL QUALITY CONTROL
COURSE CODE	:	BWB 31403
PROGRAMME CODE	:	BWQ
EXAMINATION DATE	:	JANUARY / FEBRUARY 2022
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS.
		2. THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **OPEN BOOK**.

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1   Identify either the following statements are **TRUE** or **FALSE**. Justify your answer selection.

(a)   The purpose of most measurement systems capability studies is to determine how much of the total observed variability is due to the operator and equipment.

(2 marks)

(b)   In acceptance sampling, the consumer's risk is the risk of accepting lots of good quality which equivalent to the type I error.

(2 marks)

(c)   The variables sampling has more advantage over attributes sampling because it can accommodate several quality characteristics at the same time.

(2 marks)

(d)   One of properties in the operating characteristics curve of acceptance sampling is as the sample size increasing, the curve will becomes stepper.

(2 marks)

(e)   There is no significant difference between producer's risk and consumer's risk because both risks are dangerous to the end user.

(2 marks)

Q2   (a)   Suppose that the true fraction nonconforming p in a production process is known. The center line and control limits of the fraction nonconforming control could be given by the following equations:

$$\text{UCL} = p + 3\sqrt{\frac{p(1-p)}{n}}$$
$$\text{Center line} = p$$
$$\text{LCL} = p - 3\sqrt{\frac{p(1-p)}{n}}$$

(i)   Discuss the procedure when the process fraction nonconforming p is unknown.

(4 marks)

(ii)   Summarize the center line and control limits in the p-chart when the process fraction nonconforming p is unknown.

(3 marks)

(b)   A company produces frozen soya bean milk concentrations that are packed in 330 ml cans. These cans are formed on a machine by spinning them from the aluminum stock and attaching a metal bottom panel. The inspection of these cans reveals that a can could be possibly leaking either on the side seam or around the bottom joint when the soya bean milk concentration is filled. This nonconforming has an improper seal on either the side seam or the bottom panel. Thus, a quality control executive is assigned to handle this fraction of nonconforming cans produced by the machine. He selected 20 samples of 30 cans and each can was selected at half hour intervals over a three-shift

period in which the machine was in continuous operation. The data are shown in **Table Q2 (b).**

Table Q2 (b)

Sample Number	Number of Nonconforming Cans	Sample Number	Number of Nonconforming Cans
1	9	11	18
2	7	12	18
3	12	13	18
4	11	14	6
5	14	15	15
6	4	16	21
7	24	17	16
8	7	18	14
9	12	19	12
10	7	20	18

(i)   Construct an appropriate control charts for the data in **Table Q2(b)**. Conclude that if the process is in control. Justify your answer.

(14 marks)

(ii)   Assume the assignable causes are contributing to the out of control points. Determine the revised control limits and conclude the revised process.

(5 marks)

(iii)   Recommend the control procedure for future production. Provide relevant evidence.

(6 marks)

Q3. One of the equipments uses for microbial testing procedures is a plat carrier. The thickness of the plat carrier is a critical quality characteristic that need to be controlled and monitored during the start up stage and the mass production. After a few testing, the process is in control estimated parameter $\bar{x} = 0.75$ mm and $s = 0.02$. The process specifications are at 0.9 ± 0.08 mm. The sample size is 5.

(a)   Estimate the potential process capability.

(2 marks)

(b)   Estimate the actual process capability.

(5 marks)

(c)   Derive your conclusions regarding the capability of the process to produce items conforming to specifications. Compare your answer with result of process capability in **Q3(a)** and **Q3(b)**.

(8 marks)

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(d)   The unit costs of scrap and rework are RM 1.40 and RM 1.05, respectively. The daily production rate is 10,000 units. Analyze the total cost of scrap and rework.

(5 marks)

(e)   If the process average shifts to 0.93 mm, analyze the impact on the proportion of scrap and rework produced. Discuss in terms of cost.

(7 marks)

Q4   (a)   Explain the procedure of a single sampling plan.

(3 marks)

(b)   A quality officer wants to set a new sampling plan for a new batch of sensor components. He wants to use a single sampling plan with an acceptance sampling of five. However, the management team disagreed with his decision and ask him to revise the plan. Therefore, by using acceptance sampling of 1, 2 and 5, revise his idea and propose your solution for a single sampling plan that will accept lots that are 6% nonconforming 15% of the time. From a producer's point of view, which of these three plans would you choose? Justify your answer.

(12 marks)

(c)   A sampling plan is desired to have a producer's risk of 0.05 at AQL =0.9% and a consumer's risk of 0.10 at LQL =6.5% nonconforming. Based on that information, justify the single sampling plan that will meet the consumer's stipulation and come as close as how possible to meeting the producer's stipulation.

(16 marks)

-     END OF QUESTIONS -