MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2018/2019 ACADEMIC YEAR
THIRD YEAR SECOND SEMESTER

SCHOOL OF SCIENCE
BACHELOR OF SCIENCE IN APPLIED STATISTICS WITH COMPUTING

COURSE CODE: STA 3233
COURSE TITLE: STATISTICAL OF QUALITY CONTROL METHODS

DATE: 16TH APRIL 2019 **TIME: 0830 – 1030 HRS**

INSTRUCTIONS TO CANDIDATES

1. Attempt Question **ONE** and any other **TWO** questions.
2. Show all your Workings.

QUESTION 1

a). Explain the meaning of the following terms as used in Quality Control

(i) Product control **[1 Mark]**
(ii) Process control **[1 Mark]**
(iii) Variable **[1 Mark]**
(iv) Attribute **[1 Mark]**

b). State the reasons why control charts are more popular in todays industry.
[5 Marks]

c). Quality Control at inspection at GTZ Water Services wants to develop a control limit. If the average range for the 25 samples is 2.9 ounces and the average mean observation is 15.95 ounces, develop a three sigma control limit for bottling operations. **[4 Marks]**

d). At 95% level of significance, use the normal tables to find the upper Acceptance Limit (UAL) and Lower Acceptance Limit (LAL) for a sample of size n using the X-bar chart. **[6 Marks]**

e). A factory operates an S.S.P, a sample of X items are taken and accepted if the batch contains at most C defectives in the sample. If λ is the number of defectives and p is the unknown fraction in the batch.

i). What is the probability that a batch will be rejected? **[4 Marks]**
ii). In such a plan, a sample of 40 items is taken and the batch accepted if there are at least 3 defectives. Sketch an OC curve for the SSP.
[7 Marks]

QUESTION 2

a). Explain the following Acceptance sampling terms
i). Average Total Inspection (ATI). **[2 Marks]**

ii). Average Outgoing Quality (AOQ). **[2 Marks]**

b). A production manager at a light bulb plant has inspected the number of defective light bulbs in 10 random samples with 30 observations each. The following are the number of defective light bulbs found.

Sample	1	2	3	4	5	6	7	8	9	10
No. of defectives	1	3	3	1	0	5	1	1	1	1
Sample observation	30	30	30	30	30	30	30	30	30	30

Construct a three-sigma control chart. **[5 Marks]**

c). Karen group operates a double sampling plan. A batch of 50 steel nails is first chosen and accepted if the batch contains not more than 2 defectives in the sample and rejected if it contains 6 or more defectives. A second sample of 30 items is taken if there are 3, 4, or 5 defectives in total., otherwise the batch is accepted.

i). Obtain an expression for the probability of accepting a batch. **[6 Marks]**

ii). Sketch the O.C curve for the sampling plan. **[2 Marks]**

iii). Clearly outline the procedure involved in the double sampling plan. **[3 Marks]**

QUESTION 3

a). State any three reasons that make acceptance sampling very useful in today's world. **[3 Marks]** b). A safety matches manufacturing firm produces large batches of match boxes. Let k be the proportion of defectives. The firm inspects its batches by selecting 15 match boxes randomly and accepting the batch if there are not more than three defectives. Otherwise the batch is rejected.

i). Give an expression for the probability of rejecting a batch. **[8 Marks]**

ii). Sketch the OC-Curve for the sample plan. **[3 Marks]**

iii). A random selection of 50 items is taken from a large batch of items and inspected. The batch is accepted if not more than 2 defectives are found. What is the probability that a batch containing 10% defectives will be accepted? What is the probability that a batch containing 3% defectives will be accepted? **[6 Marks]**

QUESTION 4

a). Define the following terms as used in acceptance sampling,

i). Consumer risk. **[2 Marks]**

ii). Producer risk. **[2 Marks]**

b). Describe a single Sampling Plan (SSP). **[6 Marks]**

c). Ten samples of size four are taken from 3 kilograms of flour, the masses are as shown below:

1	2	3	4	5	6	7	8	9	10
3.07	3.02	2.85	2.99	3.02	3.05	3.10	2.96	3.14	3.06
3.02	2.98	3.06	3.14	3.07	2.95	3.00	3.02	3.10	2.98
3.03	3.06	3.02	3.06	2.98	3.04	2.90	2.97	3.05	3.04

2.99	2.96	2.97	3.02	3.06	3.07	2.95	3.10	3.08	3.10

i). Estimate the mean and standard deviations of the mass of the packet. **[4 Marks]**

ii). Plot the control chart of the sample mean assuming that the mass mean is normally distributed. **[5 Marks]**

iii). Is there any justification of continuous production of flour? **[1 Mark]**

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