

CHUKA



UNIVERSITY

## UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF COMMERCE

BCOM 366: STATISTICAL QUALITY CONTROL

STREAMS:

TIME: 2 HOURS

DAY/DATE: TUESDAY 17/04/2018

2.30 P.M – 4.30 P.M

**INSTRUCTION:**

**Answer question one and any other two**

1. (a) Distinguish between the following terms giving examples.

(i) Type 1 and type II errors [4marks]

(ii) Assignable and chance variation [4marks]

(b) The control charts for  $\bar{X}$  and R are maintained on a certain dimension of a manufactured part, measured in inches. The subgroup size is 4. The value of  $\bar{X}$  and R are computed for each subgroup, after 25 subgroups.

$$\sum \bar{X} = 398.75 \text{ and } \sum R = 7.17$$

Compute the values of the 3 sigma limits for the  $\bar{X}$  and R charts and estimated the value of  $\sigma$  on the assumption that the process is in statistical control. [6marks]

(c) Consider the data below:

Observation

Sample	1	2	3	4
1	6	9	10	15
2	10	4	6	11
3	7	8	10	5
4	8	9	6	13
5	9	10	7	13
6	12	11	10	10
7	7	5	10	4
8	16	10	8	9
9	9	7	8	12
10	15	16	10	13

- (i) Set up  $\bar{X}$  and R chart for these data. [8marks]
- (ii) Does the process seem to be in statistical control? [2marks]

(d) Summarize the acceptance sampling procedure on a flow chart. [6marks]

2. (a) A sample of  $n= 6$  collected from a process very one hour after 50 samples have been collected where  $\bar{X} = 20$  and  $\bar{S} = 1.5$ . Assuming that both charts exhibit control and that the quality is normally distributed:

- (i) Estimate the process standard deviation. [3marks]
- (ii) Find the control limit of  $\bar{X}$  and S chart. [3marks]
- (iii) Suppose another chart were to be substituted for the S chart, what would be the appropriate parameter of R chart. [3marks]

(b) Explain the advantages of statistical quality control. [5marks]

(c) The sample fraction defective for 21 sample of size 5 are given below.

- 0.22            0.46
- 0.33            0.31
- 0.24            0.24
- 0.20            0.22
- 0.18            0.22

0.24            0.29  
 0.24            0.31  
 0.29            0.21  
 0.18            0.26  
 0.27            0.24  
 0.31

Calculate the control limit for the p-chart.

[6marks]

3. (a) The following table give the number of missing rivets of the final inspection of aircrafts:

Airplane	No of missing rivets	Air plane no.	No. of missing rivets
901	9	912	12
902	28	913	10
903	17	914	18
904	10	915	14
905	19		
906	12		
907	14		
908	6		
909	2		
910	8		
911	14		

**Required:**

- (i) Find  $\bar{c}$  the average number of missing rivets per plane.  
 (ii) Construct a c- chart for these data. Does the process appear to be in control? If not assume that assignable causes can be found for all points outside the control limits and calculate the revised control limit. [15marks]
- (b) Explain the general approach to management of quality. [5marks]

4. (a) Consider the data shown below:

Sample no	$x_1$	$x_2$	$x_3$	$x_4$
1	6	12	10	8
2	10	6	7	9
3	7	8	12	10
4	7	13	10	11
5	8	9	7	6
6	10	7	10	6
7	14	10	11	14
8	18	6	19	12
9	8	15	12	16
10	6	12	14	16
11	9	9	10	15
12	14	4	6	11
13	6	8	10	5
14	16	9	6	13
15	14	10	7	13
16	13	10	18	19
17	12	16	10	13
18	20	7	18	12
19	10	10	6	7
20	8	4	6	11

**Required:**

- (a) Obtain control limits for the  $\bar{X}$  and R charts. [10marks]
- (b) Does the process seem to be in statistical control? If necessary revise the trial control limits. [10marks]