CHUKA   **UNIVERSITY**

UNIVERSITY SUPPLEMENTARY/SPECIAL EXAMINATIONS.

FOURTH YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN COMMERCE

BCOM 477: STATISTICAL QUALITY CONTROL

STREAMS: BCOM   **TIME: 2 HOURS**

DAY/DATE: THURSDAY 26/07/2018   **11.30 A.M - 1.30 P.M**

INSTRUCTIONS:
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QUESTION ONE
1.   (a) Distinguish between the following terms: -
    (i) Assignable and chance variation.   [2 Marks]
    (ii) Type I and Type II errors.   [2 Marks]

  (b) Find the probability of acceptance in a single sampling plan with $n=100$ and $c=5$.
    Take the lot fraction defective = 0.05.   [5 Marks]

  (c) Control charts for $\acute{x}$ and R are maintained on a certain dimension of a manufactured part, measured in inches. The subgroup size is 4. The ratios of $\acute{x}$ and R are computed for each subgroup, after 20 subgroups.

$$\sum \acute{x}=398.75 \text{ and } \sum R=7.17$$

Compute the values of 3 sigma limits for the $\acute{x}$ and R charts and estimate the value of δ on the assumption that the process is in statistical control.   [6 Marks]

(e) Summarize the acceptance sampling procedure on a flow chart.   [6 Marks]

(f) Outline three approaches to sentanginls.   [3 Marks]

QUESTION TWO
(a) Given n = 6 and k = 3, determine the probability of defecting a shift to M = Mo + 2δ on the first sample solutions the shift. [3 Marks]

(b) The sample fraction defective for 21 sample of size 5 are given below;

0.21	0.18	0.29
0.31	0.17	0.31
0.24	0.31	0.25
0.21	0.48	0.26
0.19	0.33	0.24
0.24	0.24	
0.24	0.22	
0.29	0.22	

Calculate the control limit for the P-Chart. [6 Marks]

(c) The following table give the number of missing rivets of the final inspector of aircrafts.

Airplanes	No. of missing rivets	Airplane	Number of missing rivets
901	19	914	15
902	18	915	24
24903	7	916	13
904	22	917	20
905	9	918	11
906	10	919	9
907	10	920	16
908	15	921	11
909	8	922	29
910	14	923	10
911	28	924	12
912	8	925	6
913			

Required:
   (i) Find $\acute{c}$ 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. [11 Marks]

QUESTION THREE
(a) In a double sampling plan, the parameters are $n_1=50, c_1=2, n_2=90$ and $c_2=6$. Consider lot with exactly 10% defectives. Find: -

(i) The probability of acceptance on the 1st sample.   [4 Marks]
(ii) The probability of acceptance on the 2nd sample.   [8 Marks]
(iii)   The probability of acceptance.   [3 Marks]

(b) Suppose the process average fraction non conforming shifted to 0.15. What is the probability that the shift would be detected on the 1st subsequent sample?   [2 Marks]

(c) Explain 3 uses of statistical quality control methods.   [3 Marks]

QUESTION FOUR
Consider the data shown below

Sample No.	X_1	X_2	X_3	X_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	16	10	18	19
8	7	5	10	4
9	9	7	18	12
10	15	16	10	13
11	18	12	14	16
12	6	13	19	11
13	16	19	13	15
14	7	13	10	12
15	11	7	10	16
16	15	10	11	14
17	19	8	12	10
18	15	7	10	11
19	8	6	19	12
20	14	15	12	16

(a) Obtain control limits for $\acute{x}$ and R charts.   [10 Marks]

(b) Does the process seem to be in statistical control? If necessary, revise the final control limits.   [10 Marks]
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