

PRINCE OF SONGKLA UNIVERSITY**FACULTY OF ENGINEERING****Midterm Examination : Semester II****Academic Year 2003****Date : December 26, 2003.****Time : 09.00-12.00****Subject : 225-348 Quality Control****Room : R300****Instruction :**

1. There are 4 questions 100 marks.
2. Books and notes are allowed.
3. Borrowing things from other students is prohibited.
4. A calculator and a dictionary are allowed.

Problem	Full Score	Score
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

Assoc. Prof. Dr. Sunchai Klinpikul**Instructor**

1. Control charts for X and R are maintained on the tensile strength of a metal fastener. After 30 samples of size $n = 6$ are analyzed, we find that.

$$\sum_{i=1}^{30} X_i = 12,870 \quad \text{and} \quad \sum_{i=1}^{30} R_i = 1,350$$

(a) Compute control limits on X and R charts. (10 marks)

(b) Assuming that the R chart exhibits control, estimate the population mean and standard deviation. (10 marks)

2. A company purchases a small metal bracket in containers of 5,000 each. Ten containers have arrived at the unloading facility, and 250 brackets are selected at random from each container. The number of nonconforming brackets in each sample are :

<u>Container No.</u>	<u>No. of NC brackets</u>
1	0
2	0
3	0
4	1
5	2
6	5
7	1
8	0
9	0
10	<u>2</u>
Total	<u>11</u>

(a) Calculate the control chart for this problem. (10 marks)

(b) Do the data from this shipment indicate statistical control ? If not, what is your recommendation ? (10 marks)

3. A triple sampling plan is being used by a consumer in which a first sample of 25 items leads to lot acceptance if no defectives are found and to lot rejection if two or more defectives are found. If one defective is found, a second sample of 50 items is drawn and the lot is accepted if no additional defectives are found in the second sample and rejected if two or more additional defectives are found. If one defective is found in the second sample, a third sample of 100 items is inspected. The lot is accepted only if no defectives are found in the third sample.
- (a) Assuming that the lot size is large in relation to the sample size, determine the probability of acceptance at 0.4% fraction defective. (15 marks)
- (b) What is the producer's risk ? (5 marks)

4. A manufacture of electronic parts has a continuous process at the average rate of 300 parts per hour. The company decides to apply a continuous sampling plan with AOQL 0.8 %. Due to a limited QC staff the company has to select a sampling frequency at the rate of 1 part for every 20 minutes.

(a) What is a proper continuous sampling plan of the company. (5 marks)

(b) If the process average is 1.25 % defective, what is the average outgoing quality of this sampling plan. (15 marks)

5. Answer the following questions :

(1.) Given a lot size of $N = 120$ $AQL = 1\%$, what is a double sampling plan at tighten inspection. (4 marks)

(2.) Given the same lot size as problem 1, process average 0.5% , $AOQL 3\%$ what is a proper rectified double sampling plan. (4 marks)

(3.) What is a single sampling plan for $\alpha = 0.05$, $\beta = 0.10$, $AQL = 1.5\%$,
 $LTPD = 7\%$ (4 marks)

- (4.) What is a proper double sampling plan for AQL 1.2 %, LTPD = 8.2 % ,
 $\alpha = 0.05$, $\beta = 0.10$ using equal sample size. (4 marks)

- (5.) Calculate the average sample number for a double sampling plan at the
process average of 1 % . (4 marks)

$$n_1 = 20 \quad c_1 = 0$$

$$n_2 = 30 \quad c_2 = 2$$

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