

PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Mid Term Examination : Semester II**Academic Year : 2007****Date : January 6, 2008.****Time : 09.00 – 12.00****Subject : 225-348 Quality Control****Room : R300**

ทอจริตใการสอบ โทษจันต่าปรับตคใการยวิชานัน
และพัการเรียน 1 ภาคการศึกษา

Instructions :

1. There are 5 questions, 100 points.
2. Attempt all questions.
3. Books and notes are allowed.
4. A calculator and a dictionary are allowed.
5. Borrowing things from other students is prohibited.

Problem	Full Score	Score
1	20	
2	30	
3	10	
4	20	
5	20	
Total	100	

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Instructors



1. Thirty samples each of size seven have been collected in order to establish control over a process. The following data were collected.

$$\sum_{i=1}^{30} \bar{x}_i = 2,700 \quad \sum_{i=1}^{30} R_i = 120 \quad \sigma_R = 0.23$$

(a) Suppose that the R chart is in statistical control, estimate the standard deviation of the process.

(10 points)

(b) Calculate 2.5-sigma control limits for \bar{x} and R charts.

(10 points)

2. A fraction nonconforming control chart with $n = 400$ has the following parameters.

$$\text{UCL} = 0.0809$$

$$\text{Center line} = 0.0500$$

$$\text{LCL} = 0.0191$$

(a) Find the width of the control limits in standard deviation units.
(ie. what is the value of k for k -sigma control limits)

(10 points)

(b) If this chart is converted to np chart, what should be the equivalent parameters of this np chart? (ie. What is the UCL and LCL for the np chart)

(10 points)

(c) What is the probability that a shift in the process to 0.045 for the np chart in (b) will be detected on the first sample following the shift?

(10 points)



3. A control chart for defects for final inspection of a radio is to be established. The desired inspection unit is to be a group of 10 radios. From the past data, the average number of defects per radio is 0.5 .

Find 3-sigma control limits for this control chart.

(10 points)



4. A double sampling plan for a specific QC inspection in a manufacturing company with the process average of 1% defective is;

Lot size	=	10,000
n_1	=	50
C_1	=	0
n_2	=	120
C_2	=	2

(a) Find the probability of accepting the lot in the 1st sampling and the probability of rejecting the lot in the 1st sampling.

(5 points)

(b) If this plan is converted to a rectified double sampling plan, what is the AOQ and ATI.

(15 points)



5. Answer the following questions : (20 points)

5.1 Explain briefly how can we classify the quality characteristics of a product and give some examples.

(5 points)

**5.2 Design a single sampling plan, given $\alpha = 2\%$ $\beta = 14\%$ AQL = 1 %
LTPD = 13 %**

(3 points)

**5.3 Design a double sampling plan, given a lot size of 5,000
inspection level I, AOQ = 0.65 %, tighten inspection.**

(3 points)

5.4 Given a lot size of 4,000, process average = 2 %, and AOQL = 3% Determine a rectified double sampling plan.

(3 points)

5.5 What is the probability that a lot will be accepted in the first sample from the rectified double sampling plan in 5.4 .

(3 points)

5.6 A manufacturing company is producing a certain spare parts for automobile with a continuous process rate of 300 pieces per hour. The company desires to set up a continuous sampling plan, CSP-1 with a fraction defective rate (f) of 6.67 % and AOQL = 4.0 %. What is the continuous sampling plan CSP-1 for the company.

(3 points)

