PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Midterm Examination : Semester II   **Academic Year** : 2005

Date : December 12, 2005.   **Time** : 09.00–12.00

Subject : 225–348 Quality Control   **Room** : R300

ทุจริตในการสอบ โทษขั้นต่ำปรับตกในรายวิชานั้น
และพักการเรียน 1 ภาคการศึกษา

Instruction :

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

Prob. no.	Full Score	Score
1	25	
2	25	
3	10	
4	20	
5	20	
Total	**100**	

Assoc. Prof. Dr. Sunchai Klinpikul
Instructor

1. Control charts for $\overline{X}$ and R are in use with the following parameters :

$\overline{X}$ Chart	R Chart
UCL = 363	UCL = 16.18
Center line = 360	Center line = 8.91
LCL = 357	LCL = 1.64

The sample size is n = 9. Both charts exhibit control. The quality characteristic is normally distributed.

(a) What is the error type I of the $\overline{X}$ chart ?   (10 points)

(b) Suppose the mean of the process shifts to 357, what is the probability that the shift will not be detected on the first sample of the following shift ?

(15 points)

2. Statistical monitoring of a quality characteristic uses both $\overline{X}$ and S charts. The charts are to be based on the universe mean of 200 and known standard deviation of 10. Sample size (n)= 4.

(a) Find a 3-sigma control limit for S chart.   (10 points)

(b) Find the center line and control limits of $\overline{X}$ chart such that the probability of a type I error is 0.05 .   (15 points)

3. In designing a fraction nonconforming chart with center line at 0.2 and 3-sigma control limits, what is the minimum sample size required to yield a non-negative lower control limit ?   (10 points)

4. A textile mill wishes to establish a control chart on flaw in towels it manufactures. Using an inspection unit of 50 units, past inspection data show that 100 previous inspection units had 850 total flaws.

(a) Design a proper control chart at 2-sigma control limit. (10 points)

(b) Design a control chart having a type I error at 0.06 and compare with the chart from (a). (10 points)

5. Suppose that a single rectified sampling plan with n =150 and c = 2 is being used for receiving inspection where the vendor ships the product in lots of size N = 3,000.

(a) Draw the AOQ curve and find AOQL.   (10 points)

(b) If the process average of the vendor is 2 % defectives, what is the AOQ and ATI of this sampling plan ?   (10 points)