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PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Mid Term Examination Semester II **Academic Year 2004**
Date : December 19, 2004. **Time : 9.00-12.00 AM.**
Subject : 225-348 Quality Control **Room : R300**

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ทุจริตในการสอบโทษขั้นต่ำ คือ ปรับตกในรายวิชาที่ทุจริต และ พักการเรียน 1 ภาคการศึกษา โทษสูงสุดให้ออก

Instruction :

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

Problem No.	Full	Score
1	25	
2	20	
3	20	
4	20	
5	15	
Total	**100**	

Assoc. Prof. Dr. Sunchai Klinpikul
Instructor

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1. A normally distributed quality characteristic is monitored through the use of an $\overline{X}$ and R chart. These charts have the following parameters (n = 4).

$\overline{X}$ chart	R chart
UCL = 626.00	UCL = 18.795
Center line = 620.00	Center line = 8.236
LCL = 614.00	LCL = 0

Both charts are in statistical control.

(a) What is the estimated standard deviation of the process ? (5 points)

(b) Suppose an S Chart were to be substituted for the R chart. What would be the parameters of the S Chart ? (10 points)

(c) If specifications on the product were 610 ± 15, what would be your estimate of the process fraction nonconforming ? (10 points)

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2. A manufacturing company uses 2-sigma p chart to control defectives in the production line which has an average fraction defective of 1%.

(a) If the company decided to set lower control limit at zero, what should be the sample size of this control chart ? (10 points)

(b) What is the probability that a fraction defective from a sample will fall outside the upper control limit ? (use Poisson Approximation) (10 points)

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3. The manufacturer wishes to set up a control chart at the final inspection station for a regulator. Defects in workmanship and visual quality features are checked. For the last 26 days, 185 regulators were inspected and 1,017 nonconformities reported.

(a) What type of control chart would you recommend ? and what is the center line and control limits. (10 points)

(b) What is the probability of type I error for the control chart in part (a) ? (10 points)

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4. A continuous processing line in a cassette deck manufacturing company has an average production rate of 1200 pieces per hour. The average fraction defective is 2.5 %. The company decided to use CSP-1 to control the quality of the cassette deck with a fraction inspection rate of 1 piece per 10 minutes.

(a) Determine a CSP-1 plan. (using AOQL = 1.9 %) **(10 points)**

(b) Calculate AOQ for this plan. **(10 points)**

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5. Given AQL = 1 %, LTPD = 7.5 % , $\alpha = 0.05$ and $\beta = 0.10$

(a) Find a proper single sampling plan. (5 points)

(b) From the result in (a), find the maximum lot size for normal inspection, general level. (5 points)

(c) If this plan is a rectified sampling plan and the process average is 2 %, using maximum lot size from (b), calculate ATI without replacement. (5 points)