# Faculty of Engineering

# Prince of Songkla University

**Final Examination : Semester II**          **Academic Year : 2004**

**Date : February 24, 2005.**          **Time : 09.00-12.00**

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

| ทุจริตในการสอบ โทษขั้นต่ำปรับตกในรายวิชานั้น และพักการเรียน 1 ภาคการศึกษา |
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**Instructions :**

1. There are 6 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.

| Problem no. | Full score | Score |
|:---:|:---:|:---:|
| 1 | 15 | |
| 2 | 15 | |
| 3 | 10 | |
| 4 | 10 | |
| 5 | 10 | |
| 6 | 40 | |
| Total | 100 | |

**Asso. Prof. Dr. Sunchai     Klinpikul**

**Instructor**

1. The number of workmanship non-conformities observed in the final inspection of disk - drive assemblies has been tabulated as shown below.

| Day | No. of Assemblies Inspected | No. of Non-conformities |
|-----|-----|-----|
| 1 | 2 | 10 |
| 2 | 4 | 30 |
| 3 | 2 | 18 |
| 4 | 1 | 10 |
| 5 | 3 | 20 |
| 6 | 4 | 24 |
| 7 | 2 | 15 |
| 8 | 4 | 26 |
| 9 | 3 | 21 |
| 10 | 1 | 8 |

(a) Determine the proper 3-Sigma control chart of the disk – drive assemblies. (5 points)

(b) Does the process appear to be in control ? (10 points)

Name …………………………. ID Code …………

2. A final inspection test in an electric lamp manufacturer uses a double sampling plan for a lot size of 10,000 as follow :

$$n_1 \quad = \quad 100 \quad c_1 \quad = \quad 0$$
$$n_2 \quad = \quad 100 \quad c_2 \quad = \quad 2$$

a) If the process average of this company is 2% , what is the probability of accepting lot in the first and second sampling? (10 points)

b) What is the average sampling number ? (5 points)

3.  A Chemical ingredient is packed in metal containers. A large shipment of these containers has been delivered to a manufacturing facility. The mean bulk density of this ingredient should not be less than $0.15$ g/cm$^3$. Suppose that lots of this quality are to have a 0.95 probability of acceptance. If the mean bulk density is as low as 0.145, the probability of acceptance of the lot should be 0.10. Suppose that we know that the standard deviation of bulk density is approximately 0.005 g/cm$^3$. Obtain a variable sampling plan that could be used to sentence the lots.

(10 points)

4. The specified bending moment of fishing rods produced from a company is 12,000 pounds with the probability of acceptance 95% and the customer would accept the fishing rods having bending moment of 11,500 pounds with a probability of 10%. Since the company does not know the standard deviation of the process, therefore the QC staff collects 10 samples of fishing rods and obtains the bending moment data as follows :

| 12,500 | 11,500 | 11,800 | 12,200 | 12,780 |
| 11,980 | 12,600 | 12,980 | 11,200 | 12,670 |

Determine a proper sampling plan for this company (10 points)

5. An oversea cable–line company wants to buy a special type of submersible alkaline battery to use under water with the minimum operating life time of 5,000 hours with the probability of acceptance 0.95. The company decides to perform the test with replacement until 6 units are failed. The required number of alkaline batteries to be tested are 5 times of the failure units.

Determine a proper life test plan for the batteries                (10 points)

6. Answer the following questions :                    (40 points)

(1)  What is a rectified single sampling plan for a lot size of 4,500 with an average fraction defective of 0.1%,  given AOQL = 3%                    (5 points)

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(2)  Determine a sampling plan for variable when AQL = 0.01 RQL = 0.20, Probability of acceptance for AQL lot is 90% and for RQL lot is 15%, standard deviation is unknown.                    (5 points)

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(3)  List all major criteria and scores for national quality award.          (5 points)

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(4) Explain briefly about your assignment as follows:        (5 points)

- What is the assignment topic ? ...................................................

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- List the name of the students in your group.

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- What is the procedure of the assignment ?

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- What can you learn from this assignment in terms of quality control ?

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(5) How can you solve the problem of adversary subsystem in an organization ?

(5 points)

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(6) Explain briefly about Balanced Score Card and KPI.        (5 points)

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(7) Restricted procedures in ISO9000:2000 are :　　　　　　(5 points)

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(8) What is the reliability after 100 hours of an alkaline battery having an average failure rate of 10 units per 2,000 working hours ? (Assume PDF is a negative exponential distribution)　　　　　　(5 points)

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