

PRINCE OF SONGKLA UNIVERSITY  
FACULTY OF ENGINEERING

Midterm Examination: Semester 1  
Date: 1<sup>st</sup> August, 2005  
Subject: 226-541 Research Methodology  
Instructor: Boonsiri Limsakul

Academic Year: 2005  
Time: 17:00-20:00  
Room: IEF309

ทศจรีตในการสอบ โทษขันต่ำปรับตคในรายวิชานั้น และพัคการเรียน 1 ภาคการศึกษา

**Direction**

- There are 3 set of problems for this exam.
- Score for each question is as following.  
Question 1 – 20 marks  
Question 2 – 35 marks  
Question 3 – 45 marks
- All materials, books, and calculator are allowed.
- Write your name, student ID, and department on every pages of test material.

Student Name \_\_\_\_\_ Student ID \_\_\_\_\_

Question No.	Full Score	Assigned Score
1	20	
2	35	
3	45	



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1. A normally distributed random variable has an unknown mean ( $\mu$ ) and a known variance  $\delta^2=9$ . Find the sample size required to construct a 95 percent confidence interval on the mean, which has the total width of 3.0.



2. Two machines are used for filling plastic bottles with a net volume of 16 ounces. The filling processes can be assumed to be normal, with standard deviations of  $\delta_1=0.015$  and  $\delta_2=0.018$ . The quality engineering department suspects that both machines fill to the same net volume, whether or not this volume is 16 ounces. A random sample is taken from the output of each machine.

Machine 1	Machine 1	Machine 2	Machine 2
16.03	16.01	16.02	16.03
16.04	15.96	15.97	16.04
16.05	15.98	15.96	16.02
16.05	16.02	16.01	16.01
16.02	15.99	15.99	16.00

- 2.1. Do you think the quality engineering department is correct? At  $\alpha=0.05$

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2.2. Determine a confidence interval on the true difference between net volumes  
at  $\alpha = 0.05$



3. A manufacturer of television sets is interested in effect on tube conductivity of four different types of coating for color picture tubes. The following conductivity data are obtained: Testing at  $\alpha = 0.05$

Coating Type	Conductivity #1	Conductivity #2	Conductivity #3	Conductivity #4
1	143	141	150	146
2	152	149	137	143
3	134	136	132	127
4	129	127	132	129

- 3.1 Is there a difference in conductivity due to coating type?

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3.2 Estimate the overall mean and the treatment effects.



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3.3 Compute a 95% interval estimate of mean of coating type 4. Compute a 95 % interval estimate of mean difference between coating type 1 and 4.

