Name..... ID Code .....

PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination: Semester II — Academic Year: 2005
Date: March1, 2006 — Time: 13.30-16:30
Subject: 225-384 Fundamental of Engineering Statistics — Room: A400

Instructions

- Write your name and student ID on the answer book and exam paper.
- Write your answer in the answer book only, show your work clearly and legibly.
- This is an opened-book examination.
- There are 6 problems plus one bonus problem and total score is 90 (+10).
- Carefully read the problems and answer all questions in each problem.

ทุจริตในการสอบ โทษขั้นต่ำ คือ พักการเรียน 1 ภาคการศึกษา และปรับตกในรายวิชาที่ทุจริต

Do your best and good luck

Thanate Ratanawilai

Name..... ID Code .....

1. **(15 points)** The average height of males in the freshman class of an engineering faculty has been 174.5 cm, with a standard deviation of 6.9 cm. Is there any reason to believe that there has been a change in the average height if a random sample of 50 males in the freshman has an average height of 177.2 cm? Use a 0.02 level of significance.

2. **(15 points)** A manufacturer claims that the average tensile strength of thread A exceeds the average tensile strength of thread B by at least 12 kilograms. To test his claim, 50 pieces of each type of thread are tested under similar conditions. Type A thread had an average tensile strength of 86.7 kilograms with a standard deviation of 6.28 kilograms, while type B thread had an average tensile strength of 77.8 kilograms with a standard deviation of 5.61 kilograms. Test the manufacturer's claim using a 0.05 level of significance.

3. **(15 points)** The amounts of a chemical component y, which were dissolved in 100 grams of water at various temperatures, x, were recorded as follows:

X (^{0}C)	Y (grams)		
0	8	6	8
15	12	10	14
30	25	21	24
45	31	33	28
60	44	39	42
75	48	51	44

   (a) Find the equation of the regression line.
   (b) Estimate the amount of chemical that will dissolve in 100 grams of water at 50^0C.
   (c) Test the hypothesis that $\beta = 0$, using a 0.01 level of significance, against the alternative that $\beta \neq 0$.

4. **(15 points)** Four kinds of fertilizer f_1, f_2, f_3, and f_4 are used to study the yield of beans. The soil is divided into three blocks each containing four homogeneous plots. The yields in kilograms per plot and the corresponding treatments are as follows:

Block 1	Block 2	Block 3
$f_1 = 42.7$	$f_3 = 50.9$	$f_4 = 51.1$
$f_3 = 48.5$	$f_1 = 50.0$	$f_2 = 46.3$
$f_4 = 32.8$	$f_2 = 38.0$	$f_1 = 51.9$
$f_2 = 39.3$	$f_4 = 40.2$	$f_3 = 53.5$

   Conduct an analysis of variance using the randomized complete block model and a 0.05 level of significance.

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5. **(15 points)** A large automobile manufacturing company is trying to decide whether to purchase brand A or brand B tires for its new models. To help arrive at a decision, an experiment is conducted using 12 of each brand. The tires are run until they were out. The results are

   Brand A : $\bar{x}_1$ = 37,900 kilometers, s_1 = 5,100 kilometers

   Brand B : $\bar{x}_2$ = 39,800 kilometers, s_2 = 5,900 kilometers

   Test the hypothesis at the 0.05 level of significance that there is no difference in the two brands of tires. Assume the populations to be approximately normally distributed.

6. **(15 points)** Four laboratories are being used to perform chemical analysis. Samples of the same material are sent to the laboratories for analysis as part of the study to determine whether or not they give, on the average, the same results. The analytical results for the four laboratories are as follows:

Laboratory			
A	**B**	**C**	**D**
58.7	62.7	55.9	60.7
61.4	64.5	56.1	60.3
60.9	63.1	57.3	60.9
59.1	59.2	55.2	61.4
58.2	60.3	58.1	62.3

   Find that the within-laboratory variances are significantly different or not at the α = 0.05 level of significant.

BONUS (10 points)

A survey of resident in Hatyai showed that 20% preferred a white telephone over any other color available. What is the probability that more than half of the next 20 telephones installed in this city will be white?