PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination: Semester 1 **Academic Year**: 2010

Date: 15 October 2010 **Time**: 09.00-11.00 (2 hours)

Subject Number: 241-500 **Room**: S817

Subject Title: Research and Development Methodologies

Exam Duration: 2 hours

This paper has 7 pages.

It aims to collect 33 marks (25%).

Authorised Materials:

- Writing instruments (e.g. pens, pencils).
- Textbooks, a notebook, handouts, and dictionaries are permitted.

Instructions to Students:

- Scan all the questions before answering so that you can manage your time better.
- Write your answers in **Thai**.
- Write your name and ID on every page.
- Any unreadable parts will be considered wrong.

When drawing diagrams or coding, use good layout, and short comments; marks will not be deducted for minor syntax errors.

Cheating in this examination

Lowest punishment: Failed in this subject and courses dropped for next semester.

Highest punishment: Expelled.

NO	Time (Min)	Marks	Collected	NO	Time (Min)	Marks	Collected
1	12	4		7	10	3	
2	10	3		8	15	5	
3	12	4		Total	103	34	
4	12	4		%	100		
5	20	7		25%			
6	12	4					

Question 1 **(4 Marks)**

a) Why can two calculators give different results when repeating the calculation process? (1 mark)

b) Why is it not possible to forecast the weather in a long run? (1 mark)

c) How could a small change at the input lead to an unexpectedly great effect? (1 mark)

d) Why are some statistic results unreliable? (1 mark)

Question 2 **(3 marks)**

a) Why is the reliability of a *parallel system* better than the reliability of a *series system*? (1 mark)

b) What can be done to make *System Hardware* reliable?(1 mark)

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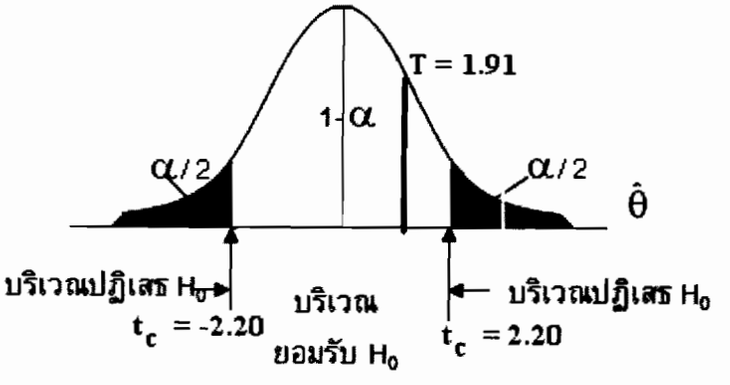
c) What can be done to make *Software* reliable? (1 mark)

Question 3 **(4 Marks)**

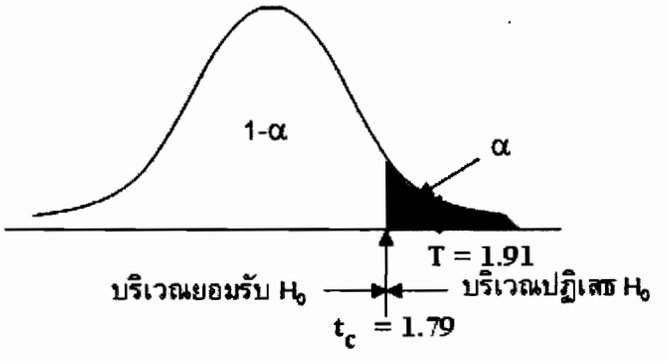
a) What is the *degree of freedom*? How to calculate it? (1 mark)

b) Why is the *significant level* of 99% still not good enough in some cases? Give an example. (1 mark)

c) Explain the results of *T-test* value in the following graphs. (2 marks)



Name_____ ID_____



Question 4 **(4 Marks)**

a) Tell the differences between *Descriptive* and *Inferential Statistics*. Also give at least two examples of each type. (2 marks)

Descriptive Statistics	Inferential Statistics

b) Explain the factors in *Time Series*. (2 marks)

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Question 5 **(7 Marks)**

From a) to e), read the cases and tell whether they are *Probability* or *Non-Probability Sampling*.

From f) to g), just answer the questions.

a) Assign each student a random number between 0 and 10, and select the person with the highest number in each village. Then accumulate the GPA of the selected students in order to represent the picture of all students in the Thailand.

b) Interview 200 PSU graduates between the age of 25 and 40 for their satisfaction about the university.

c) Select every 10th student from the student IDs to calculate the GPA of all PSU students.

d) Interview selected experts and take it as the representative of the whole population.

e) At first stage, choose a sample of areas. Later select a sample within those chosen areas.

f) Give an example of how and why *Simple Random Sampling* can be vulnerable to sampling error.

g) In which case is *Systematic Sampling* less accurate than *Simple Random Sampling*?

Question 6 **(4 Marks)**

a) Give examples of *Quantitative Variables* and *Qualitative Variables*. Give 2 examples each. (2 marks)

Quantitative variable	Qualitative variable

b) Give examples of *Independent Variables* and *Dependent Variables*. Give 2 examples each. (2 marks)

Independent variable	Dependent variable

Question 7 **(3 Marks)**

Give examples of *selling points* for a research paper.

Data	Results	Selling Points
new	new	
old	the same/similar	
old	different	

Question 8 **(5 Marks)**

From the following problems, tell which statistic methods are applicable.

a) You would like to know the relationship between the problem size (say, the size of the image) and the execution time of an image processing algorithm.

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b) You would like to check whether sensors of a certain type in a wireless sensor network, applying 5 different communication protocols, yield different average life times or not. You collect 10 samples for each protocol.

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c) You would like to know how bright a certain LED can produce light when you vary the current. You measure the illumination in Lumens. You use 6 samples for each current value, say 1 mA, 2 mA, 3 mA, 4 mA and 5 mA. You would like to know exactly which current produces how bright the light is in Lumens.

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d) You would like to compare whether there is a significant improvement in false negative results of a speech recognition method after you add a filter.

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e) You would like to predict the number of packets sent in the department network this year by analyzing previous data over the past 5 years. Also, you are aware that the overall behavior of the users changes each month. For example, more utilization during the first and second semesters, and less during October and summer. Or more utilization during the evening and less in the morning.

---------- End of Examination ----------

Written by

Pichaya Tandayya

Life is just an illusion. Don't be so serious about it.

Name_____ ID_____