



Prince of Songkla University
Department of Industrial Engineering
Faculty of Engineering

Final Examination: Semester 1

Academic Year: 2011

Date: 6 October, 2011

Time: 9:00 – 12:00

Subject: 226-401 Product design

Room: S817, S203

ทฤษฎีในการสอบ โทษขั้นต่ำ คือ ปรับตกในรายวิชาที่ทฤษฎี และพักการเรียนหนึ่งภาคการศึกษา

Instructions: Read carefully

1. All materials are allowed, except computer notebook and electronic media.
2. There are 4 parts, do all of them and write your answer as specify in the remarks.
3. You must write your name and student ID in every page of the test.
4. The total paper sheet is 14 pages.
5. The total score is 175 points.

Distribution of Score

Part	Full scores	Results	Remarks
1	45		Write in paper exam
2	45		Write in paper exam
3	45		Write in yellow book
4	40		Write in green book
Totals	175		

Tests are prepared by

Supapan Chaiprapat

Napisaporn Meemongkol

Pichet Trakarnchaisiri

Somchai Chuchom

Part 1 (อ.สุภาพรณ)

หัวข้อ ทฤษฎีสินทางปัญญา (10 คะแนน)

1. บอกความแตกต่างระหว่างสิทธิบัตรกับลิขสิทธิ์ และสิทธิบัตรกับอนุสิทธิบัตร (2 คะแนน)
2. ผลงานที่เกิดจากการสร้างสรรค์ของบุคคลใดบุคคลหนึ่ง จะได้รับการคุ้มครองตามกฎหมายลิขสิทธิ์เมื่อไร และผลงานนั้นจะได้รับการคุ้มครองเป็นเวลานานเท่าใด (2 คะแนน)
3. สิทธิบัตรการประดิษฐ์และสิทธิบัตรการออกแบบแตกต่างกันอย่างไร (2 คะแนน)
4. สิ่งประดิษฐ์ใดๆ จะได้รับการคุ้มครองจากกฎหมายสิทธิบัตรเป็นระยะเวลากี่ปี (2 คะแนน)
5. หากพบว่ามีกรณีละเมิดการใช้สิ่งประดิษฐ์ทางภูมิศาสตร์ ใครจะเป็นคนฟ้องร้องเพื่อดำเนินคดีกับบุคคลที่ละเมิด (2 คะแนน)

หัวข้อ Product Development Economics (35 points)

1. An economic analysis of product development typically is composed of 2 major processes: quantitative and qualitative analysis. Explain why in some cases the qualitative analysis is not less important than the quantitative analysis. (10 points)

2. How does “understanding the trade-offs” help us in our product development project? (10 points)

3. What is “Ramp-up cost”? Also give examples. (5 points)

4. A Base-Case Model in Table 2 is established according to the costs in Table 1. (10 points)

Table 1: The relevant financial estimates

Cost	
Development Cost	6 million Baht
Ramp-up Cost	1 million Baht
Marketing and Support Cost	0.6 million Baht
Unit Production Cost	500 Baht
Sales and Production Volume	150,000 units
Unit Price	900 Baht

Table 2: The Base-Case Model

	Year 1			Year 2			Year 3			Year 4		
	P1	P2	P3	P1	P2	P3	P1	P2	P3	P1	P2	P3
Development cost	-1,250	-1,250	-1,250									
Ramp-up cost			1,000	1,000								
Marketing & support cost				-250	-250	-250	-250	-250	-250	-250	-250	-250
Production cost					-3,000	-3,000	-3,000	-3,000	-3,000	-3,000	-3,000	-3,000
production volume					5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
unit production cost					-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Sales revenue					2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
sales volume					3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
unit price					-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8

Identify what should be corrected in Table 2 (the Base-Case table). See an example. (There are mistakes in 4 places.)

ตัวอย่าง

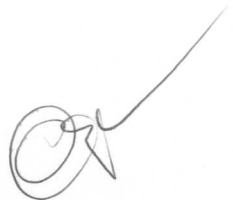
ผลรวมของค่าใช้จ่ายในการพัฒนาผลิตภัณฑ์ในตารางที่ 2 ไม่สอดคล้องกับค่าใช้จ่ายที่ระบุในตารางที่ 1

1.

2.

3.

4.



Part 2: (อ. นภิสพร)

1. (15 points) answer all these questions (accept problem g) base on your products (case assignment in the class)

a) Do you know your customers' needs?

b) What are those customers' needs?

c) How do you know them?

d) What form do you use to represent those needs?

e) How do you generate your "Hows"?



f) How do you determine the relationship of your "Hows" with your customers' needs?

g) Besides your development process, where else in your daily work might QFD apply? Define the "Whats" and "Hows."

A handwritten signature or set of initials, possibly 'OK', located in the bottom right corner of the page.

2. (15 points) The table below is the Planning Matrix. Complete this Planning Matrix by filling in the blanks

	Weighted important to customer	Customer satisfaction performance	Competitive satisfaction performance	Goal	Improvement ratio	Sales point	Overall weighting	Percentage of total
Can customize to suit my working style	81	4.6	3.8	4.6	.....	1.5	.....	.....
Easy to get the information I need	80	4.7	4.6	4.7	.....	1.2	.....	.....
Controls under my fingertips	83	3.1	4.4	4.4	.....	1.2	.....	.....
Intuitive controls	84	2.9	2.8	3.3	.....	1.5	.....	.....
Enable me to find things in the document quickly	48	3.1	4.4	4.5	.....	1.5	.....	.....
Offers lots of size, font, and design options	45	4.6	3.8	4.6	.....	1.5	.....	.....
Able to see what the fonts look like	42	4.7	4.6	4.7	.....	1.2	.....	.....
Can adjust the cursor to move as quickly as I'd like	49	2.9	2.8	2.9	.....	1	.....	.....
Totals							.....	.....

3. (15 points) List 10 reasons why reducing the number of parts in a product might reduce production cost. Also list some reasons why costs might increase.



Part 3: (ឧ.វិធាន)

Product information about notebook mouse

The mission of notebook mouse product is focused on group of computer graphic students in European countries. After the needs of customer were surveyed, they could be set as the goal, the main criteria and the sub-criteria as shown in figure 1.

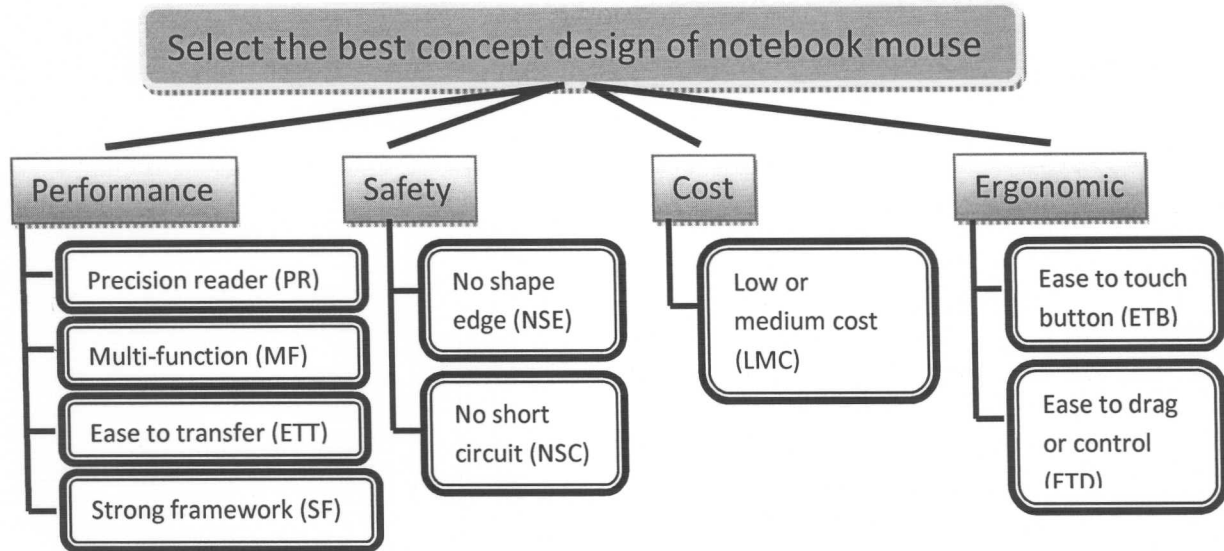


Figure 1 The main and sub-criteria of notebook mouse from customer survey.

Assume all experts of product design already gave the weight of needs in selection matrix analysis and calculated to determine the ranking score in Table 1.

Table 1: The selection matrix table for score calculation

Selection Criteria	Weight	Concept 1		Concept 2		Concept 3	
		Rating	Weighted score	Rating	Weighted score	Rating	Weighted score
PR	0.12						
MF	0.12						
ETT	0.10						
SF	0.08						
NSE	0.12						
NSC	0.10						
LMC	0.08						
ETB	0.13						
ETD	0.15						

Functional performance for notebook mouse design

Signal transportation	Power support	Multi-function	Reader	Outer casing
Wire	Wire	Laser light and power point function	Optical reader	Plating process
Wireless (2.4G)	One time use battery	Speaker and microphone	Optical reader with dots per inch adjuster	Wear resistance process
Wireless (Bluetooth)	Rechargeable battery + rechargeable device	Power saving device	Laser reader	Use soft material
Wire + wireless (Bluetooth)	Rechargeable battery + wire	Weight adjustment device	Laser reader with dots per inch adjuster	Use composite material
Wire + wireless (2.4G) + Wireless (Bluetooth)	Magnetism effect	Mnemonic function	Double laser reader	Use porous material
Other	Other	Other	Other	Other

Example of Notebook Mouse (Used as a reference product)

Design: Jonah Becker, Derek Loh, Audrey Louchart, and Oliver Franz, One & Co. (U.S.); Monique Chatterjee, Microsoft Hardware Group (U.S.); Eric Wahl, Cad-Based Solutions (U.S.)

The Microsoft Arc is a wireless notebook mouse intended for mobile laptop users. With an innovative hinge design, Arc reduces to almost half its full size when snapped shut. But it provides complete comfort, similar to a desktop mouse, when opened to its full size.

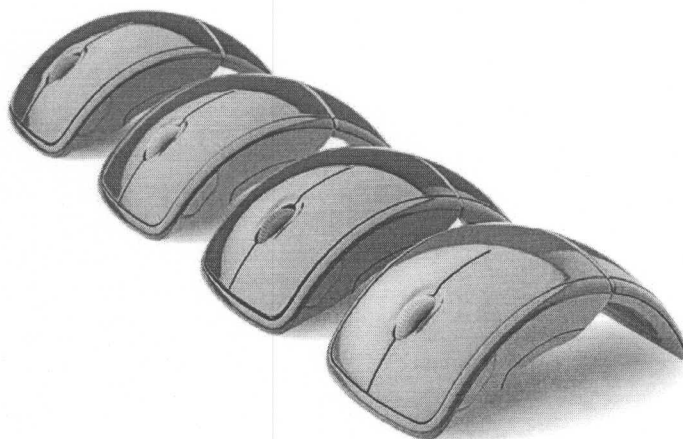


Figure 2: Microsoft Arc
Notebook Mouse

Problem of part 3 (45 points)

If the designer requires the mouse is easy to transfer, so the mouse should be a smallest size and light weight. But it may be inconvenient to use when user hand control reader or user fingers press on the mouse buttons because its size is too small than the palm of hand.

1. How can be applied TRIZ to solve this technical contradiction?

Please explain the procedure to reach the TRIZ solutions. (10 points)

2. What are the three conceptual designs from the solutions of TRIZ and support the eco-design strategies that you choose? Please sketch them and briefly explain the outstanding points in each idea. (15 points)
3. If the mouse example in figure 2 is a reference product, please do the selection matrix completely and select the best design concept by giving rating with your judgment. (10 points)
4. What are the directives for environmental design must be on process when the product from your design is exported to EU? Please explain the detail of them. (10 points)



PART 4: (อ. สมชาย)**Question #1 (25 marks)**

The designer conceives of a lightweight table of daring simplicity: a flat sheet of toughened glass supported on slender, unbraced cylindrical legs (as shown in Figure 1). The legs must be solid (to make them thin) and as light as possible (to make the table easier to move). They must support the table top and whatever is placed upon it without buckling. You are asked to answer the following 2 questions;

- 1.1) What material could you recommend for the table legs?
- 1.2) What production processes would you suggest to make the table legs?

Guideline: You should create the Design Requirements for Table Legs by answering the questions listed below;

- a) What are the functions of the design problem?
- b) Specify the objectives of the problem.
- c) Specify the constraints of the design.
- d) Specify the Free variables involved in the design.

Now you should identify information on material properties that will support your decision. Suppose the materials that lie near the trade-off surface are identified as shown in Figure 2, what are other constraints (information) that can lead you to properly select the production processes?

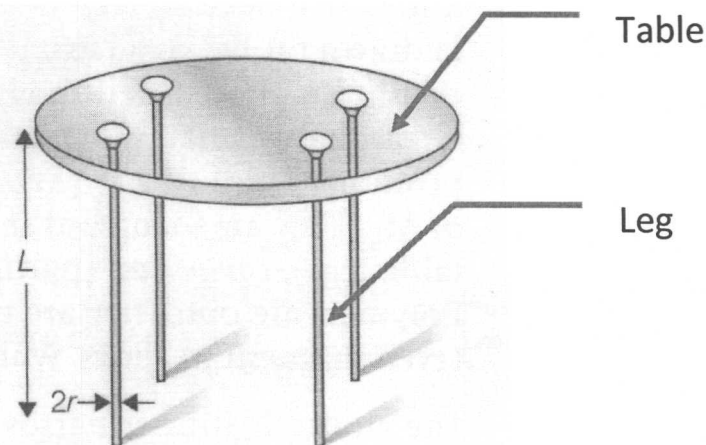


Figure 1 A Lightweight Table

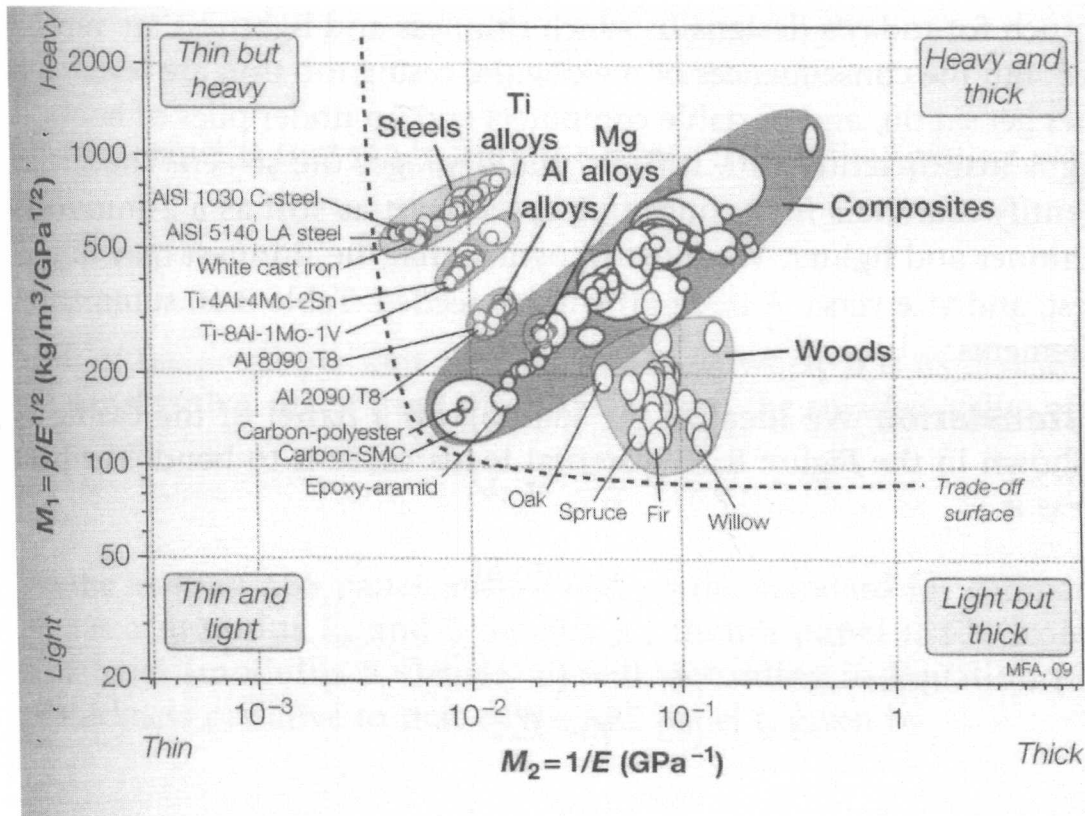


Figure 2 The Trade-off Plot for the Table Legs

(Materials that lie near the trade-off surface are identified.)

Question #2 (15 marks) Briefly explain the following questions.

- 2.1 Specify and explain at least 4 basic functions of packaging,
- 2.2 Discuss and compare the trend of packaging industries in the developed countries to the developing countries.
- 2.3 Briefly discuss the trend of the following packaging materials in general;
 - a) PE
 - b) Pulp paper
 - c) Aluminum
 - d) Glass

Handwritten signature