

**PRINCE OF SONGKLA UNIVERSITY**  
**FACULTY OF ENGINEERING**

**Final Examination :** Semester II

**Academic Year :** 2003

**Date :** February 26, 2004

**Time :** 1:30 - 4:30 PM

**Subject :** 225 - 346 Work Study

**Room :**

Before doing this test, please read this first!

1. The following materials can be led into examination room :-
  - Lecture notes, hondouts, or textbooks.
  - Electronic handheld calculator.
  - Languages translate equipment.
2. Not allow for communication equipment such as Personal Digital Assistant (PDA), mobile telephone, and laptop (notebook) computer.
3. You have to write answers to ALL questions.
4. You have to fill your name and ID on this page and on the top right of the remainder.
5. Total score is 20 points.

ทฤษฎีในการสอบ โทษขั้นต่ำปรับตกในรายวิชานั้น และ  
พักการเรียน 1 ภาคการศึกษา โทษสูงสุด ให้ออก

First name Mr/Miss ..... Surname .....

Student ID .....  IE  MfE

Score (fill by lecturer)

Part I		Part II		
points	your score	Q	points	your score
5		1	3	
		2	2	
		3	3	
		4	2	
		5	3	
		6	2	
			15	

Test is prepared by Asst. Prof. Charoen Jaitwijitra

Name .....

ID .....

**Part I** – (5 points) Matching. Next to each definition in column **A** place the best term (letter only) from column **B**. The same answer can be used more than once, or none may apply (then use letter X).

Column A		Column B
	1. Time added so as to go to drink water	A Elapsed time
	2. Element which analyst could not separate foreign element from it	B Unaccounted time
	3. Normal time divided by performance rating =	C Ineffective time
	4. The different time between finishing time and starting time is called ...	D Personal needs allowance
	5. Sum of foreign element time =	E Confidence level
	6. Recording error multiply by elapsed time =	F Outlier
	7. The instant while a previous element is completely done and a follow element is starting	G Recording error
	8. $(\text{Normal time}) \times (100 / (100 - \% \text{allowance}))$	H Observed time
	9. The rating system using skill, effort, conditions, and consistency to evaluate operator's performance	I Standard time
	10. The number of time readings needed to analyse a standard time is depended on a specified accuracy and a .....	J Westing House Rating System
	11. Should not included to standard time	K Total check time
	12. Average or mode or median time of watch times	L Breakpoint
	13. The ratio that should not be greater than 0.02	M Avoidable delays
	14. The amount of time pass before operator start the first work element of the first cycle	N Maytag's System
	15. The sum of TEBS and TEAF	O TEBF
		P Normal time
		Q Fatigue allowance
		R Unavoidable delays
		S TEAF
		T Selected time
		X none apply

Name .....

ID .....

**Part II-** (6 problems worth 15 points) Write your answers on the blank area of each problems.

1. (3 points) If an analyst want to be 90 percent confident and  $\pm 7$  percent accuracy and the following values are established for an element after 20 cycles are observed:

cycle number	1	2	3	4	5	6	7	8	9	10
minute	0.09	0.08	0.10	0.12	0.09	0.09	0.09	0.12	0.11	0.12
cycle number	11	12	13	14	15	16	17	18	19	20
minute	0.09	0.10	0.12	0.10	0.08	0.09	0.10	0.12	0.09	0.11

Compute the required number of observations. (Hint: use the formula that include t distribution value.)

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2. (2 points) Compute the maximum number of “idle hours per day” ( 8 working hours a day) when the work sampling result indicates that 10 workers were not working 100 times out of 400 times. The 97% confidence level is specified.

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Name .....

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3. (3 points) The details of a time-study's results shown on figure 1 to 4 below. You will find many fields on the Figure 4 are attemptly hidden. Do not write any answers onto these figures, only the last table following to Figure 4 is the place where you will fill your answers.

Time Study

File Tools Help

General Information

Study No. Study 1

Operation Turning workpeices

Date 01-20-2004

Operator Thaksin

Observer Banhan

Overall Rating (%)

No. of Elements 3

No. of Cycles 5

Allowance (%)

Personal Needs 5

Basic Fatigue 4

Variable Fatigue 0

Special 0

Total Allowance 9

Time Period

Study Time (hr:min) 9 : 15

Time Elapsed (min) Before Start 0.50

Finishing 9 : 28 After Finish 0.70

Study 13 Min. Elapsed 1.2 Min.

Element Description

Ele 1 A

Ele 2 B

Ele 3 C

Ele 4 D

Ele 5 E

Ele 6 F

Rating

Speed (Overall)

speed (individual)

Westinghouse

Timing Method

SNAPBACK

CONTINUOUS

Figure 1. Time study main window

Time Study Observation Entry Form

Window Cell Option Help

Study Number Study 1

Remarks

Cycle	Element 1				Element 2				Element 3			
	R	W	OT	NT	R	W	OT	NT	R	W	OT	NT
1	100		60	600	100		50	500	100		80	800
2	95		75	712	100		50	500	90		90	810
3	110		55	605	100		50	500	110		80	880
4	90		65	585	100		50	500	90		95	855
5	95		70	665	100		50	500	110		85	935
6												
7												
8												
9												

Figure 2. Observation entry form

Name .....

ID .....

OBSERVATION		FOREIGN ELEMENT				
Element Number	Cycle Number	Number	W1	W2	OT	Description
3	5	1	0	80	80	

Figure 3. Foreign element

Window

Element Number	1	2	3			
Total OT	A	B	C			
Rating	-	-	-			
Total NT	D	E	F			
Number of Observations	5	5	5			
Average NT	G	H	I			
Standard Time	.69	.545	.933			

**Total Standard Time** (sum standard time for all elements): J

**Allowance Summary**

Personal Needs	5
Basic Fatigue	4
Variable Fatigue	0
Contingency	0
Total Allowance (%)	9

**Time Check**

Total Check Time	K
Effective Time	L
Ineffective Time	M
Total Recorded Time	N
Unaccounted Time	-95
Recording Error (%)	O

Figure 4. Summary table

Name .....

ID .....

The letters A to O indicate the blanked fields, which need to fill answers to them. Write your answers to the following table:

Letter	Your answers
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
L	
M	
N	
O	

4. (2 points) The average idle during a 10-day study is 25 percent, and the number of daily of observations is 50. Compute relative accuracy if the confidence level is 95 percent.

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Name .....

ID .....

5. (3 points) Mr. Thaksin, an engineer in the Hatyai Steels Company is developing standard data of power feed cutting time of a specific plain carbon steel (0.25 to 0.50 percent of carbon) in the drill press department. The recommended speed and feed rate are 60 sfm and 0.0105 in per rev respectively. He uses 1/2 –inch high-speed drill with a 118 degree included angle to drill through material that is 1 1/8 – inch thick. Compute the cutting time.

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6. (2 points) Use the figure 5 and 6 for answering the questions below.

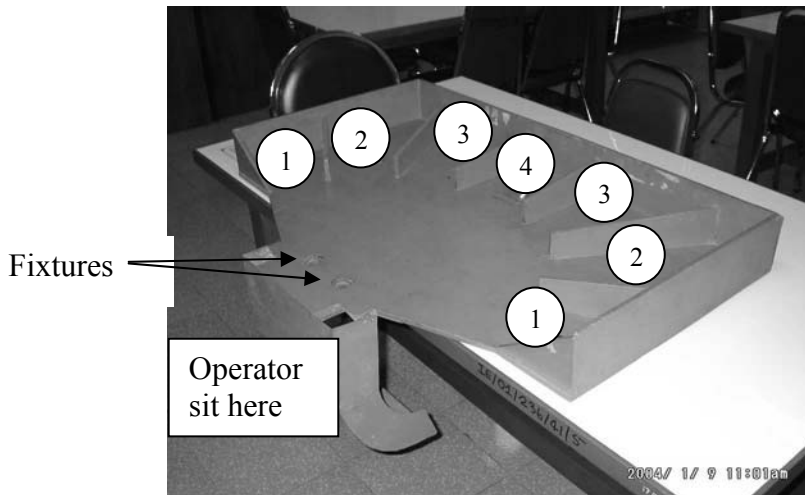


Figure 5. Work bench

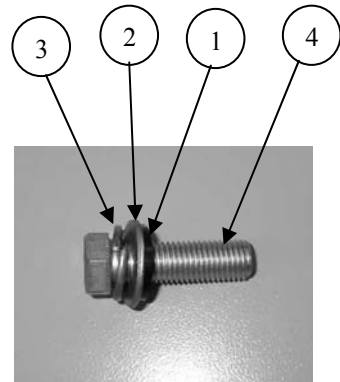


Figure 6. Finished part

Write the sequence models and their parameter indices, and then compute the times used by each sequence in TMU.

Name .....

ID .....

a) (1 point) An operator is sitting on a chair and ready to start his work in front of him. Then he moves both hands simultaneously to each side of part bins number 1, grasp up a rubber washer by each hand and *move them through the spatial space* to fixtures, place them into fixtures simulataneously. The fixture's holes are loose fit.

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The time = ..... TMU

b) (1 point) Continue from a), the operator pulls the finished parts from holes by both left and right hands simultaneously and drop them into chute.

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The time = ..... TMU

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