PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Final Examination : Semester II **Academic Year** : 2005

Date : March 2, 2006 **Time** : 1:30 - 4:30 PM

Subject : 225 - 346 Work Study **Room** : A401

ทุจริตในการสอบ โทษขั้นต่ำปรับตกในรายวิชานั้น และพักการเรียน 1 ภาคการศึกษา

Directions:

1. Lecture notes, textbooks, electronic handheld calculator and dictionary are permitted to lead into examination room.
2. ALL questions are required your answers.
3. You have to fill your name, surname, and ID on this page and on the top right of the remainders.
4. The total score is 30.

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

Student ID .....

Score (fills by lecturer)

Q	points	gain
1	5	
2	5	
3	5	
4	5	
5	5	
6	5	
	30	

This test is prepared by Asst. Prof. Charoen Jaitwijitra

Name .....

ID .....

1. The data in the following table represent time-study observations for an assembly process. On the basis of these observations, find the standard time for the process. Assume a 10% allowance factor.

Element	Performance Rating (%)	Observations (minutes)				
		1	2	3	4	5
1	100	1.5	1.6	1.4	0.1*	1.5
2	90	2.3	2.5	2.1	2.2	2.4
3	120	1.7	1.9	1.9	1.4	1.6
4	100	3.5	3.6	3.6	3.6	3.2

*Disregard—possible error.

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2. Mr.Udom, an industrial Engineer of the Siam Rubber Wood factory at Hatyai district, had to examine the times used for drilling a hole on a piece of wood. Assume that the drilling operation composes of three work elements. He made 16 observations by using the direct time study method. The following table displays the times (in minutes) used for the first element

0.07	0.09	0.06	0.07	0.08	0.08	0.07	0.08
0.09	0.07	0.08	0.08	0.07	0.09	0.08	0.08

Name .....

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2.1. If this time study requires 95 percent confidence level and 10 percent accuracy, he used the Maytag company method for examining the number of observations of this element, how many observations are required for?

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2.2. Compute the standard deviation and the mean of this element.

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2.3. If he uses the following formula:

$$t\frac{s}{\sqrt{N}} = k\overline{X}$$

When

t	=	t-distribution
s	=	standard deviation of sample
N	=	number of observations
k	=	a fraction of $\overline{X}$
$\overline{X}$	=	mean value

Compute the number of observations when this study require $\pm$7 percent of accuracy.

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3. A bank officer counts out 10,000 Baht in denominations of five 1,000 Baht bills, six 500 Baht bills, and twenty 100 Baht bills. The purpose of this operation is to supply these bank notes in automatic teller machines (ATM). If he has to counts out for many cycles and suppose a continuous stopwatch time study yielded the following data (the times are in minutes):

Element	Cycle no.								Performance Rating (%)
	1	2	3	4	5	6	7	8	
1. Counts of 5 bills of 1,000 Baht	.12	.66	1.24	1.95	3.26	3.91	4.52	5.05	110
2. Counts of 6 bills of 500 Baht	.27	.84	1.40	2.12	3.41	4.08	4.66	5.21	115
3. Counts of 20 bills of 100 Baht	.38	.96	1.51	2.20	3.52	4.18	4.74	5.29	105
4. Wraps	.56	1.09	1.80	2.41	3.80	4.36	4.94	5.48	110
5. Places in chute	-	-	-	3.13[a]	-	-	-	-	90

Remarks

a = Occurs once every 10 cycles.

The allowances for this job are at 15% of the workday (8 hours.)

Name .....

ID .....

3.1. Calculate the average and normal times, then fill them in the blanks of the following table: (The times shown above are **cumulative** time values)

Element	Average time	Rating	Normal Time
1. Counts of 5 bills of 1,000 Baht		110	
2. Counts of 6 bills of 500 Baht		115	
3. Counts of 20 bills of 100 Baht		105	
4. Wraps		110	
5. Places in chute		90	

3.2. Calculate standard time per cycle.

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3.3. What is the standard output in term of 10,000 –Baht bundles/hour?

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Name .....

ID .....

4. The group of five workers of the shipping division perform the following steps so as to prepare the finished product to customers:

Remove cartons from conveyor and stack on pallets.
Transport pallets by forklift truck to shipping area and store in racks.
Make up customer orders on pallets. Each order is made up on one or more pallets.
Move completed orders to loading dock by forklift truck.

4.1. If they work five days a week and eight hours a day, how many total time worked for a week in minutes?

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4.2. By using the work sampling technique, the number of 425 incoming – cartons activities out of 1000 of total observations was found. How many percent of time for incoming cartons activity?

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Name .....

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4.3. If the number of incoming cartons is 4000, the performance rating is 0.85, and total allowances are 20 percent, what is the standard time per carton?

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5. Use the time study observation form as shown in the next page to answer the questions 5.1 to 5.3. The unit of column W and OT is "1/100 minutes" while column NT is "1/1000 minutes".

Time Study Observation Form

Study No.: 1	Date: Jan 5, 2006	Page 1 of 1
Operation: Core making	Operator: Pracha	Observer: Charcen

Element No. and Description	1 Fill core box with sand and press down				2 Press sand down with trowel				3 Get & place plate on core box & remove				4 Carry plate with core											
Note	Cycle	R	W	OT	NT	R	W	OT	NT	R	W	OT	NT	R	W	OT	NT	R	W	O	NT	R	W	OT	NT
	1		09	09			15	06			28	13			32	04									
	2		41	09			46	05			59	13			62	03									
	3		71	09			79	08			94	15			98	04									
	4		107	09			13	06			27	14			30	03									
	5		38	08			43	05			56	13			59	03									
	6		67	08			72	05			85	13			88	03									
	7		98	10			204	06			18	14			21	03									
	8		28	07			33	05			46	13			49	03									
	9		57	08			62	05			76	14			79	03									
	10		87	08			93	06			306	13			09	03									
	11																								
	12																								
	13																								
	14																								
	15																								
	16																								
	17																								
	18																								

Summary						
Total OT						
Rating	110%	100%	110%	105%		
Total NT						
No. Observations	10	10	10	10		
Average NT	0.0935	0.0570	0.1485	0.0336		
% Allowance						
Elemental Std. time						
No. Occurences	1	1	1	1		
Standard Time						

Total Standard Time (sum standard time for all elements): 0.3657

Foreign Elements				
Sym	W1	W2	OT	Description
A				
B				
C				
D				
E				
F				
G				

Rating Check	
Synthetic Time	%
Observed Time	

Time Check		
Finishing Time		9:08 a.m.
Starting Time		9:05 a.m.
Elapsed Time		
TEBS	0.00	
TEAF	0.11	
Total Check Time		
Effective Time		
Ineffective Time		
Total Recorded Time		
Unaccounted Time		
Recording Error %		

Allowance Summary	
Personal Needs	5
Basic Fatigue	4
Variable Fatigue	1
Special	–
Total Allowance %	10

Remarks:

Name .....

ID .....

5.1. Calculate the TOTAL normal time.

Name .....

ID .....

5.2. Calculate the TOTAL standard time.

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5.3. Calculate recording error in percent.

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Name .....

ID .....

6. Write the sequence models including their parameter indices and then compute the (total) times for the questions 5.1 and 5.2.

   6.1. (Ms. Chorpaka is sitting on a chair and ready for doing her task). She starts by grasping a TV remote controller which is placed on table within reach. She then stands up and walks 5 steps to another table and lay aside the remote controller on table.

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   6.2. Mr. Chalermchai reaches both hands to the opposite directions to touches plain steel washers with forefingers (only one washer for each forefinger). Draws them with both forefingers simultaneously and places into counterbored holes in front of him.

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