

**PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING**

Final Examination : Semester II**Academic Year : 2008****Date : February 16, 2009.****Time : 13.30 - 16.30****Subject : 225-351 Industrial Plant Design****Room : R300**

ทุจริตในการสอบ โทษขั้นต่ำปรับตกในรายวิชานั้น
และพักการเรียน 1 ภาคการศึกษา

Instructions :

1. There are 4 questions, 100 points.
2. Attempt all questions.
3. A sheet of paper note at size A4, a dictionary and a calculator are allowed.
4. Borrowing things from other student is prohibited.

Problem no.	Full Score	Score
1	20	
2	20	
3	20	
4	40	
Total	100	

Assoc. Prof. Dr. Sunchai Klinpikul

Instructor

1. An investor is considering to establish a factory in two possible locations A and B. The raw materials will be purchased from three sources as follows :

	<u>Source</u>	<u>Amount (tons/y)</u>	<u>Distance from A(km)</u>	<u>B(km)</u>
1	X	1,000	72	132
2	Y	1,500	43	103
3	Z	800	125	80

The finished products will be shipped to 6 destinations as follows :

	<u>Destinations</u>	<u>Quantity (tons/y)</u>	<u>Distance from A(km)</u>	<u>B(km)</u>
4	P	600	125	65
5	Q	500	125	80
6	R	300	55	115
7	S	700	115	55
8	T	400	70	130

The investment costs of the factory at A and B is 35 and 75 million Baht respectively.

Formulate this problem using Simple Plant Location Problem (SPLP)

(20 points)

2. Some tasks and the order in which they must be performed according to their assembly requirements are shown in the following table. These are to be combined into workstations to create an assembly line. The factory operates 7.5 hours per day. The output requirement is 1,000 units per day.

<u>Task</u>	<u>Preceding Tasks</u>	<u>Time (sec)</u>	<u>Task</u>	<u>Preceding Tasks</u>	<u>Time (sec)</u>
A	-	15	G	C	11
B	A	24	H	D	9
C	A	6	I	E	14
D	B	12	J	F, G	7
E	B	18	K	H, I	15
F	C	7	L	J, K	10

(a) Determine the number of workstation and the Lowest Possible Cycle time.

(10 points)

(b) Balance the assembly line using COMSOAL algorithm and calculate the line efficiency.

(10 points)

Note (Select task which has more following tasks first, then select larger task if the number of following tasks is equal)

3. A new frozen food factory had analyzed the area requirement for each department and material flow among departments as:

<u>Department</u>	<u>Area Requirement</u>
Raw Material Receiving	10 X 10 m
Beheading, peeling	10 X 20 m
Sizing, weighing, arranging	10 X 30 m
Cooking	10 X 10 m
Freezing	10 X 20 m
Machine Room	10 X 10 m
Cold Storage	10 X 20 m

From-to-Chart

		To							
		Dept.	1	2	3	4	5	6	7
From	1	-	40	-	-	-	-	-	-
	2	16	-	24	-	-	-	-	-
	3	-	-	-	7	17	-	-	-
	4	-	-	-	-	7	-	-	-
	5	-	-	-	-	-	-	5	27
	6	-	-	-	-	-	-	-	5
	7	-	-	-	-	-	-	-	-

Note : units in 1000 kgs. per day

(a) Design a flow relationship chart of the factory. (10 points)

(b) Using ALDEP algorithm to make a layout of the factory using sweep width = 1 and the width of the building is 30 meters.

(10 points)

4. Answer the following questions : (40 points)

**(4.1) Explain about the Electrostatic Precipitator. How does it work ?
What is its efficiency ?**

(5 points)

**(4.2) Explain about a conventional activated sludge system. How
does it work ? and How to control the system ?**

(5 points)



(4.3) Explain about the difference between thermal oil heater and steam boiler ?

(5 points)

(4.4) Explain the types of heat load for designing an air conditioning system.

(5 points)



(4.5) Calculate the efficiency of a facultative pond using the following data : (5 points)

BOD₅ of the influent = 600 ppm

Pond Volume = 7,200 m³

Q = 600 m³/d

Avg. Temperature = 27⁰ C

(4.6) Explain the criteria in designing a steam distribution system.

(5 points)

(4.7) Explain the following terms :

(5 points)

BOD₅ =

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BOD_L =

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DS =

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COD =

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TKN =

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(4.8) Explain how to remove iron and manganese from underground water.

(5 points)

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