

Prince of Songkla University
Faculty of Engineering

Final Examination : Semester I**Academic Year : 2005****Date : 6 October 2005****Time : 13.30-16.30****Subject :225-449 Industrial Plant Design****Room : หัวหูน**

ทฤษฎีในการสอบ โทษขั้นต่ำปรับตกในรายวิชานั้นและพักการเรียน 1 ภาคการศึกษา

Instruction:

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 form other students is prohibited.*

<i>Problem no.</i>	<i>Full Score</i>	<i>Score</i>
<i>1</i>	<i>20</i>	
<i>2</i>	<i>20</i>	
<i>3</i>	<i>20</i>	
<i>4</i>	<i>40</i>	
<i>Total</i>	<i>100</i>	

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Instructor



1. A new fabrication plant is considering to establish a plant in 4 possible location A,B,C,D. The three major customers to which the plant has to provide services have the following data.

Customer	No.of trips per year	Distance from customer (km)			
		A	B	C	D
1	200	25	30	10	25
2	800	15	45	10	25
3	1,500	20	40	50	35

Note: Transportation cost is 1.50 Baht per kilometer

More information collected from each possible location consists of :

Item	Location			
	A	B	C	D
Construction (mil B)	20	25	30	15
Labor Availability (Full=100 points)	75	80	65	55
Infrastructure (Full=100 points)	65	70	75	90

Given the weighing coefficients for construction cost and transportation are 5 and labor availability and infrastructure are 4 and 3 respectively.

Determine the best location for the fabrication plant.

(20 points)

2. An electric appliance company has the following assembly line for electric fans as follows:

	<u>Work Element Time (sec)</u>	<u>Immediate Preceding Task</u>
1. Fix the base of the fan	12	-
2. Electric preparation	24	-
3. Fix the body to the base	40	1
4. Fix the motor and connect the wire	6	1,2
5. Assemble the switch	18	2
6. Fix the control panel to the base	7	3
7. Fix the blade to the body	20	3
8. Install motor to the body	36	3,4
9. Balance the blade and fix with the motor	16	6,7,8
10. Assemble the switch to the motor base	23	5,8
11. Fix the guard and test	30	9,10
12. Packing	7	11

If the production rate of the assembly line is 480 sets per day (working hours per day = 8), balance the assembly line using COMSOAL Technique. Assign larger task as a bias selection rule and calculate the line efficiency. (20 points)

3. Wastewater from a food processing factory has an average BOD_5 of 1,200 ppm with the average flow rate of 1,500 cubic meters per day. The factory operates one shift per day.

Design a wastewater treatment system consisting of one anaerobic pond followed by a conventional activated sludge system.

Calculate size of anaerobic pond, volume of aeration tank, volume of sedimentation tank, and horse power required for aerators. (20 points)

Note: use the appropriate parameters which you had learned from the class and use

$COD=1.5 BOD_5$

Amir


4. Answer the following questions:

(1) Calculate the dimension of a pond having a pond volume of 2,400 cubic meters, depth of the pond 3 meters. Width of the pond is half of the length. The slope of the pond is 45° .

(4 points)

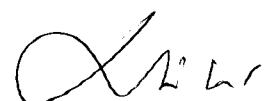
(2) Calculate the efficiency of a facultative pond having influent BOD_5 of 600 ppm. Use detention time = 15 days and average temperature of $27^\circ C$.

(4 points)



(3) The Japanese standard for clean air in an air-conditioned room consists of :
(4 points)

(4) Sketch a cross – sectional diagram of a wet scrubber. (4 points)



(5) Explain the following terms : (4 points)

BOD₅ =
.....
.....

COD =
.....
.....

DS =
.....
.....

TKN =
.....
.....

(6) Sketch a process diagram of underground water treatment. (4 points)

Ans

(9) Sketch a diagram of a refrigeration system. (4 points)

(10) Identify types of heat load for air condition system design. (4 points)

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