

PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination: Semester 2
Date: February 15, 2010
Subject: 225-351 Industrial Plant Design

Academic Year:2009
Time: 13:30-16:30
Room: Robot, S201

ทฤษฎีในการสอบ โทษขั้นต่ำ คือ พักการเรียน 1 ภาคการศึกษา และปรับตกในรายวิชาที่ทฤษฎี

Directions:

- There are 5 questions. The total score is 100.
- Write your own answer on your examination sheets.
- This examination is **closed book exam**; however, the students can take these following to the exam room,
 - 2 A4 pages with **your own note writing and the instructor signature**
 - A dictionary
 - A calculator

Name..... Student ID

Question	Full scores	Assigned Scores
1.	20	
2.	20	
3.	20	
4.	20	
5.	20	
Total	100	

Assoc. Prof. Wanida Rattanamanee
Instructor

☺☺☺ Good Luck ☺☺☺

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Code.....

1. (20 points) The WWW factory produces 3 types of car spare parts that are part A, B and C. Their average monthly demand are 20,000 , 18,000 and 25,000 pieces, respectively. In the factory, there are 6 main processes that are turning, grinding, milling, drilling, shaping and packing. Each main process uses machine to produce the product. Each part requires processes to produce as follow;

Part A : Turning → Grinding → Milling → Packing

Part B : Drilling → Grinding → Shaping → Packing

Part C : Turning → Drilling → Grinding → Milling → Packing

The production rates in minutes per piece of each part at each process are listed as follow;

Process	Production Rate		
	Part A	Part B	Part C
Turning	5	-	4
Grinding	4	5	2
Milling	8	-	2
Drilling	-	6	3
Shaping	-	2	-
Packing	10	15	10

Assuming that the average fraction defectives for these part 2%, 5% and 3%. Calculate the number of machines required to fulfill the demand. The factory operate 10 hours per day and 25 days per month.

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2. (20 points) The from-to material flow for an 6 department facility is given in the table below

		TO					
		A	B	C	D	E	F
FROM	A	-	100		20		150
	B		-	30	200		20
	C			-	30		8
	D		150		-	50	30
	E					-	250
	F						-

Note : unit flow = kilogram per hour

- (12 points) Calculate torque of this from-to and develop the from-to chart to reduce the torque value.
- (8 points) Construct a relationship diagram based on the above material flow matrix.

3. (20 points) A factory produces wood toys with the sequence process by Figure 1.
1. Time (sec.) for each process is shown by the value above each circle.
 - a. (5 points) Calculate the cycle time and number of work stations if the production rate is 1,000 pieces per day and working hours are 10 hours per day.
 - b. (10 points) Balance the production line by using COMSOAL Technique, select longer task.
 - c. (5 points) Calculate the line efficiency.

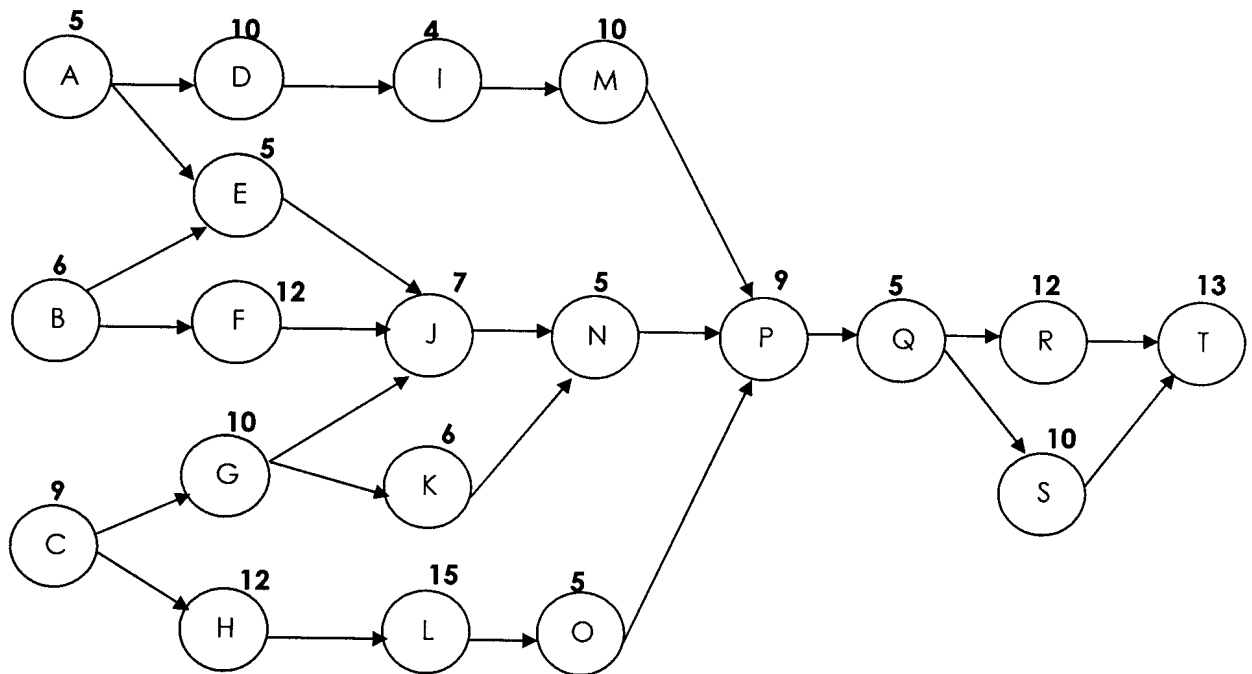


Figure 1

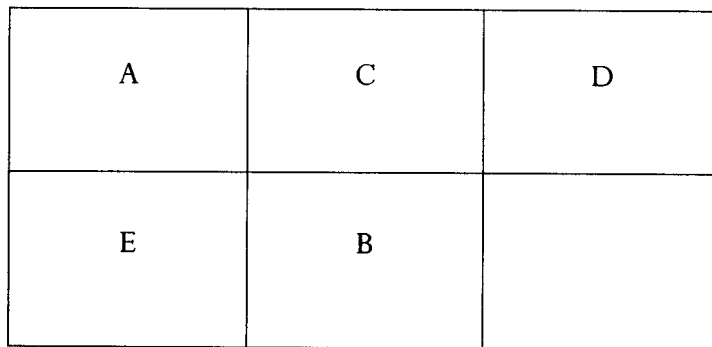
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4. (20 points) Suppose the following layout is provided as the initial layout to CRAFT. The flow-between matrix and the layout are given below. The area of each department is $20 \times 20 \text{ m}^2$.

To

	A	B	C	D	E
A	-	100		20	150
B		-	30	200	20
C			-	30	
D				-	50
E					-

FROM



- a. (10 points) Calculate the total distance of the initial layout.
- b. (10 points) Select 2 departments which will be changed its location and the total distance of the new layout will be reduced. Calculate the total distance of the new layout.

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5. (20 points) Answer or fill in the following questions,

a. (2 points) List the possible sources of raw water which can be used in the factory.

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b. (2 points) What is temporary hardness of water?

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c. (2 points) About suspended solids, what are total solids? How are total solids measured?

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d. (2 points) Explain the following terms:

BOD₅ =

BOD_L =

e. (4 points) List all types of heat load for the calculation of an air conditioning system in a 7-11 convenient store.

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f. (4 points) List all essential accessories of a steam boiler.

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g. (4 points) List the main components of an air condition system and explain briefly about the function of each component.

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