

PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Final Examination : Semester 1

Academic Year : 2010

Date : October 14, 2010

Time : 09:00-12:00

Subject : 226-316 Logistics & Material handling system

Room : S817

Directions :

- Can take any books to the room.
- Show your solutions and methods on the exam sheet.
- There are 5 problems, 100 points. You must do all of them.
- Can use any calculators.

Name.....Code

Question	Full Scores	Taken Scores
1	15	
2	20	
3	15	
4	25	
5	25	
Total	100	

ทุจริตในการสอบ โทษขั้นต่ำปรับตกในรายวิชานั้น และพักการเรียน 1 ภาคการศึกษา

Assoc. Prof. Wanida Rattanamanee

Lecturer

Pichet.T.

1. (15 points) Material Flow

There is a $50 \times 40 \text{ m}^2$ area (as shown in Fig. 1). There are 6 departments for this area. Each department uses $12 \times 12 \text{ m}^2$ space. Design the 4 m. aisle for the area. Determine the percent aisles. Explain advantage and disadvantage for your design.

50 m.

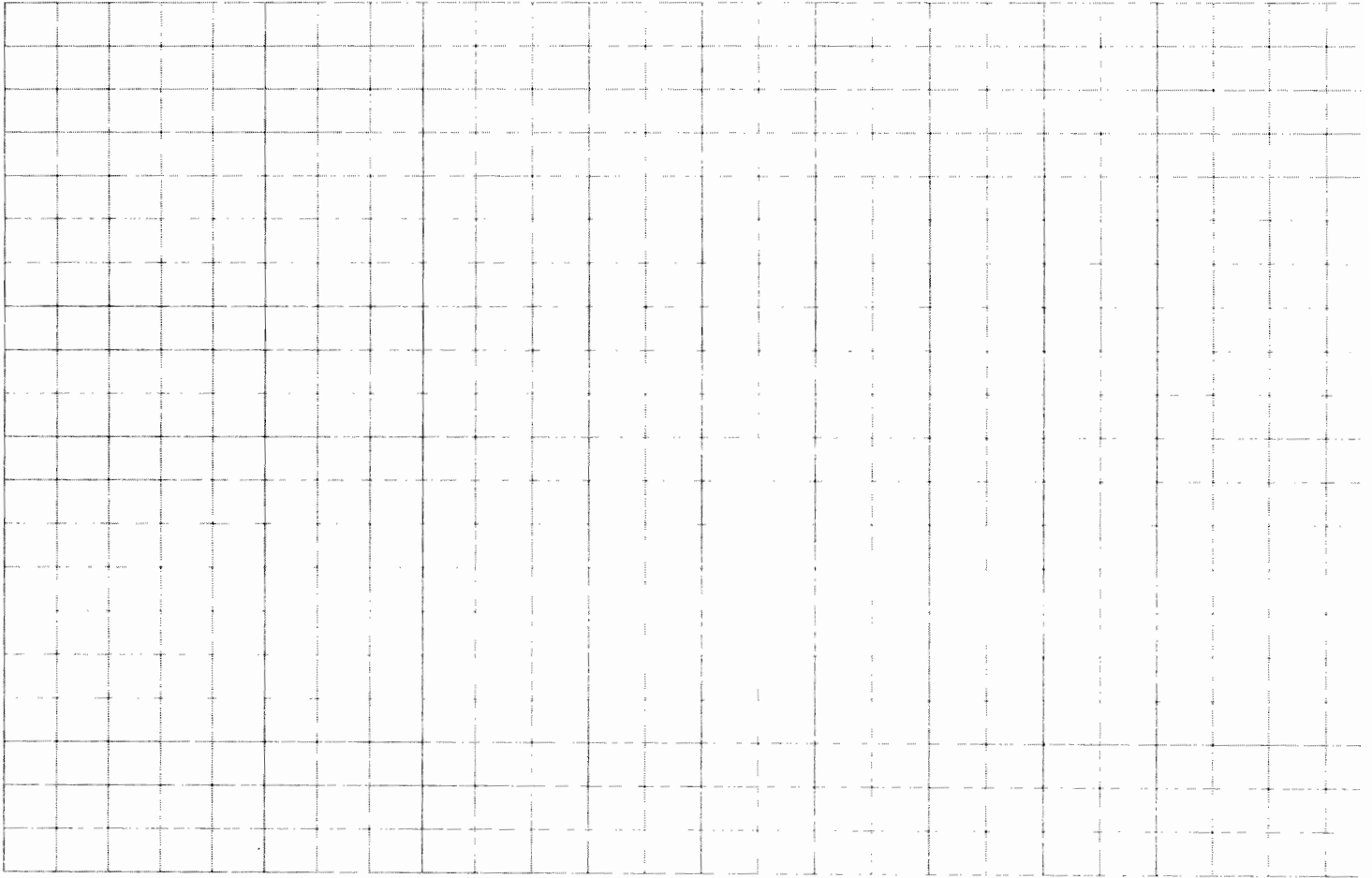


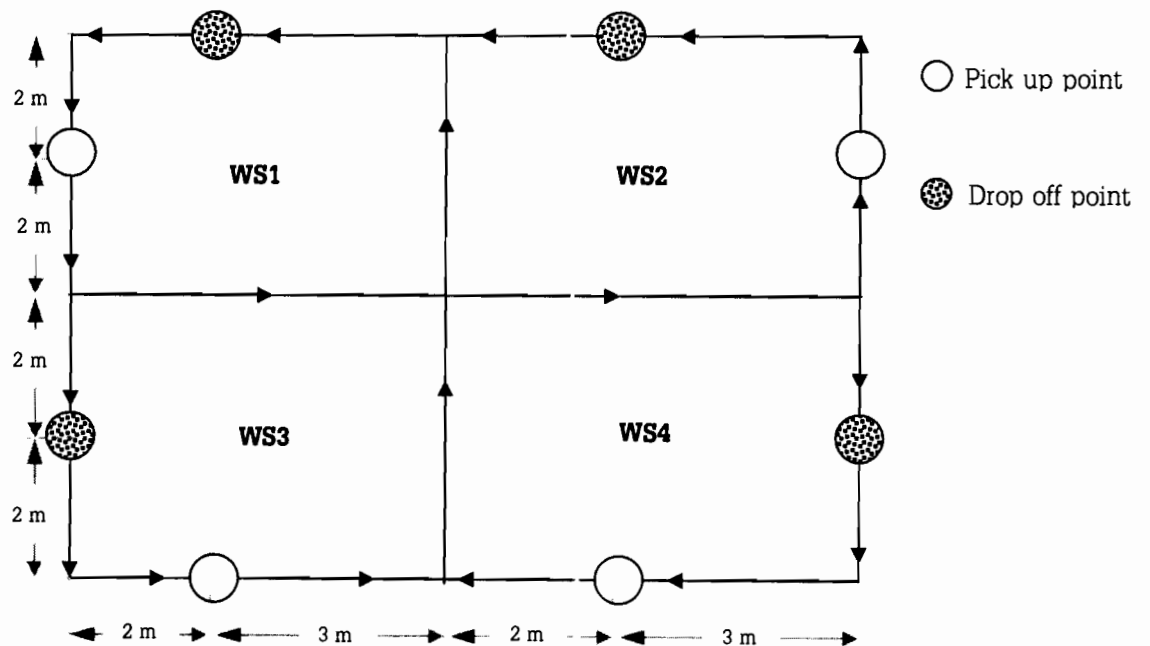
Fig.1 $50 \times 40 \text{ m}^2$ area

Pichot.T.

2. (20 points) In a factory, there are 4 workstations, WS 1, WS 2, WS 3, and WS 4 for 6 products; A, B, C, D, E and F. Production scheduling, production capacity, and product weight of each product are shown in Table 1. The factory manager would like to apply AGV system for the production. He designed AGV guided path as shown in Figure 2. Material handling capacity of the selected AGV type is 50 kilograms per trip. Its velocity is 20 meter per minute. Its efficiency is 0.9 and it has to be charged the energy after it works for 9 hours ($t = 45$ minutes). Pick up and drop off time is 1.5 min. There are 10 working hours per shift. Determine the following questions

Table 1 Detail of production

Product type	Production scheduling	Production capacity (parts/day)	Weight (kg.)/ part
A	1 → 2 → 4 → 1	5,000	2.0
B	1 → 2 → 3 → 4	6,000	2.5
C	1 → 2 → 4 → 3	3,000	1.0
D	1 → 4 → 3 → 4	4,000	1.5
E	1 → 4 → 3 → 1	2,500	1.0
F	1 → 3 → 4 → 3 → 2	3,000	0.5



Pichet.T

2.1 g_{23} , g_{24} , g_{31} , g_{32} , g_{14} and g_{41} (6 points)

2.2 How many AGV should be applied in the factory. (use the 2nd case, equation 7.3, from chapter 7 of the book.) (14 points)

2.1 $g_{23} =$
 $g_{24} =$
 $g_{31} =$
 $g_{32} =$
 $g_{14} =$
 $g_{41} =$

2.2

To From	1	2	3	4
1				
2				
3				
4				

3. (15 points)) A factory selects the AS/RS for its warehouse. For the system, there are 6 aisles. Each aisle is able to store 30 unit loads in vertical storage and 40 unit loads in horizontal storage. The unit load size ($x \times y \times z$) is $70 \times 90 \times 100 \text{ cm.}^3$. In addition, a b and c value of the system are 4, 5, 2 cm., respectively. Vertical and horizontal velocity of S/R machine are 450 and 500 cm./s. For the warehouse system, there are 30 single commands and 25 dual commands. From these data, calculate 1) the AS/RS space and 2) Does this AS/RS system appropriate? Give the supported reasons. ($T_p = T_d = 10\text{S}$)

4. (25 points) A carousel storage system is to be designed to serve a mechanical assembly plant. The specifications on the system are that it must have a total of 400 storage bins and a throughput of at least 125 S/R transactions/hr. Two alternative configurations are being considered : (1) a one-carousel system and (2) a two-carousel system. In both cases, the width of the carousel is to be 4.0 ft. and the spacing between carriers = 2.5 ft. One picker-operator will be required for the one-carousel system and two picker-operators will be required for the two-carousel system. In either system $v_c = 75$ ft./min. For the convenience of the picker-operator, the height of the carousel will be limited to five bins. The standard time for pick-and-deposit operation at the load/unload station = 0.4 min if one part is picked or stored per bin and 0.6 min if more than one part is picked or stored. Assume that 50% of the transactions will involve more than one component. Determine: (a) the required length and corresponding throughput rate of the one-carousel system (10 points) and (b) the required length and corresponding throughput rate of the two-carousel system (10 points). (c) Which system better satisfies the design specifications? (5 points)

5. (25 points) From class presentation, answers the following questions,

Material Flow (5 points)

5.1 From “Material flow analysis in the aluminum industry”, what are the benefits of the MFA models created by the aluminum industry? (3 points)

5.2 From “Production efficiency improvement by using computer simulation models and value stream mapping in a case-study roasted and group coffee plant”, how does the paper relate to material flow? (2 points)

Robot (5 points)

5.3 From “Robot based logistics system for hospitals-survey”, which robot is designed to control blood samples delivery and other transportation tasks within the hospitals and the laboratories? (2 points)

5.4 From “Design and control of quad-led robot”, what are the benefits of this leg? (3 points)

AGV (5 points)

5.5 From “Effects of multiple-load AGV factors on manufacturing system performances”, what are computer simulation and ARENA? (3 points)

5.6 From “Design for a tandem AGV system with two-load AGVs”, what is two-load AGVs? **(2 points)**

AS/RS (5 points)

5.7 From “AS/RS with two levels simultaneously operation stacker crane”, what is the difference between the class AS/RS and the paper AS/RS ? **(2 points)**

5.8 From “Design, development and analysis of automated storage and retrieval system with single and dual command dispatching using MATLAB”, what is the objective of the paper? **(3 points)**

Warehouse (5 points)

5.9 From “Analysis of order-picking in warehouses with fishbone layout”, what is fishbone layout and which one is better between traditional with middle cross and fishbone layout when travelling distance is considered? **(2 points)**

5.10 From “Intelligent warehouse management system with RFID technology case study : Phimai Footwear Co., Ltd. ”, what are the function of RFID in this warehouse? **(3 points)**

😊😊😊 GOOD LUCK 😊😊😊

Pichet .f.