



PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Midterm Examination: Semester 2

Date: February 22, 2011

Subject: 226-431 Manufacturing Automation

Academic Year: 2010

Time: 9:00-12:00

Room: S817

ทูลจรดในการสอบ โทษขันต่ำ คอ พักการเรยน 1 ภาคการศึกษา และปรบตคในรายวิชาที่ทูลจรด

ข้าพเจ้าจะชื่อสตัยในการสอบ

Name ID

คำสั่ง:

1. ข้อสอบมีทั้งหมด 11 ข้อ ในกระดาษคำตอบ 9 หน้า
2. ห้ามการหยิบยืมสิ่งใดๆ ทั้งสิ้นจากผู้อื่น เว้นแต่ผู้คุมสอบจะหยิบยืมให้
3. ห้ามนำส่วนใดส่วนหนึ่งของข้อสอบออกจากห้องสอบ
4. ผู้ที่ประสงค์จะออกจากห้องสอบก่อนหมดเวลาสอบ แต่ต้องไม่น้อยกว่า 30 นาที ให้ยกมือขออนุญาตจากผู้คุมสอบก่อนจะลุกจากที่นั่ง
5. เมื่อหมดเวลาสอบ ผู้เข้าสอบต้องหยุดการเขียนใดๆ ทั้งสิ้น
6. ผู้ที่ปฏิบัติเข้าข่ายทูลจรดในการสอบ ตามประกาศคณะวิศวกรรมศาสตร์ มีโทษ คือ ปรบตคในรายวิชาที่ทูลจรด และพักการเรยน 1 ภาคการศึกษา
7. ให้ทำในข้อสอบ พร้อมกับแสดงวิธีทำอย่างละเอียด
8. เขียนชื่อ รหัสนักศึกษา ในข้อสอบทุกหน้าก่อนเริ่มทำ เพื่อป้องกันความสับสนกรณีกระดาษคำตอบหลุดจากฉบับ
9. ให้นักศึกษาสามารถนำสิ่งต่อไปนี้เข้าห้องสอบได้
 - ตำรา
 - หนังสือ
 - กระดาษ
 - Dictionary
 - เครื่องคิดเลข ไม่จำกัดรุ่น
10. ให้ทำข้อสอบได้โดยใช้
 - ปากกา
 - ดินสอ

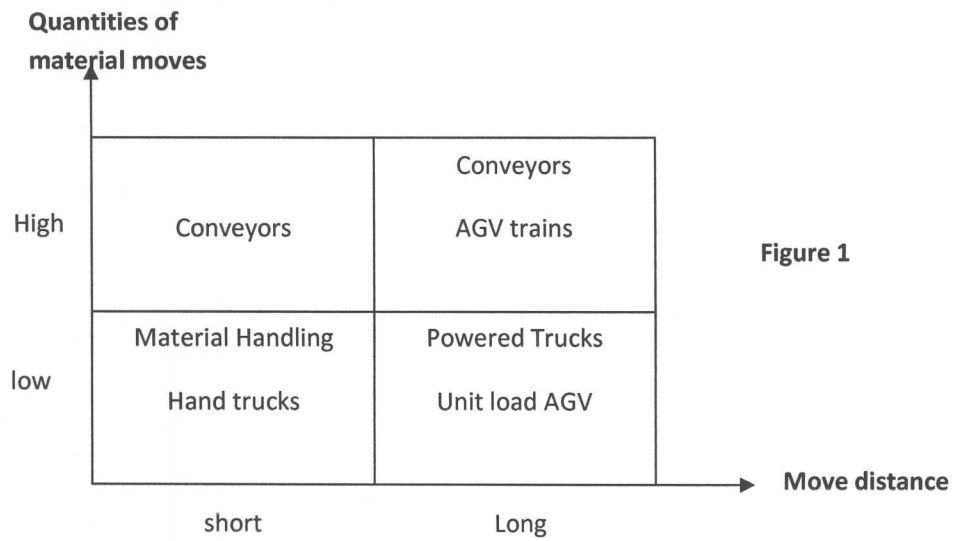
Assoc. Prof. Wanida Rattanamanee

Instructor

Name ID

Question	Full scores	Assigned Scores
1.	5	
2.	5	
3.	5	
4.	5	
5.	20	
6.	15	
7.	5	
8.	5	
9.	10	
10.	20	
11.	25	
Total	120	

1. (5 points) From figure 1, explain the conceptual of this picture.



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2. (5 points) From Figure 2, what is the concept of the picture? How do the automation concept solve this situation?



Figure 2

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3. (5 points) From Figure 3, what is the concept of the picture? How do the automation concept solve this situation?



Figure 3

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4. (5 points) What is “unit load”? Give one example of **automated** unit load equipment.

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5. (15 points) In a factory, there are 6 workstations, WS 1, WS 2, WS 3, WS 4, WS 5, WS 6. There are 4 products, A B C and D, produced in the factory by these 6 workstations. Amount, 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 Fig 4. Material handling capacity of the selected AGV type is 50 kilograms per trip. Its velocity is 2 meter per minute. Its efficiency is 0.8 and it has to be charged the energy after it works for 8 hours (t = 30 minutes). Pick up and drop off time is 0.5 and 0.6 respectively. If there are 10 work hours per day, how many AGV should have in the factory. (use the 2nd equation from the slide presentation)

Table 1 Detail of production

Product type	Production scheduling	Production capacity (parts/day)	Weight (kg./ part)
A	1 → 3 → 4 → 6	2,000	0.5
B	2 → 3 → 4 → 5 → 6	5,000	0.5
C	1 → 2 → 3 → 4 → 5 → 6	1,000	0.8
D	1 → 4 → 5 → 6	3,000	0.5



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6. (15 points) Consider an AS/RS with dedicated storage/retrieval machine per aisle, 5 aisles in the whole system. Information regarding the system is as given below:

- 6.1 Size of unit load is 10, 15, 20 (x, y, z) in. In addition, values of a, b, c are 0.4, 0.25, and 0.4 in., respectively.
- 6.2 two feet wide aisles separate racks from the side walls and one end of wall of the structure
- 6.3 length of a storage aisle = 500 unit loads
- 6.4 height of a storage aisle = 400 unit loads
- 6.5 height between top level of rack and building ceiling = 10 in.
- 6.6 Pick up time = 1.5 min. and drop off time per unit load = 1.5 min.
- 6.7 Average system horizontal and vertical travel speed are 40 ft./min and 30 ft./min respectively.
- 6.8 For one aisle, 500 times/day of the storages are done under single command cycle. 400 times/day of the storages are performed under dual command cycles.

Determine:

- 1. What is the minimum space requirement (Volume, width \times length \times height) of the AS/RS system? (8 points)
- 2. Can the S/R machine handle the handling workload over the eight hours? If the answer is yes, what is the utilization of the S/R machine? If not, how many storages and retrievals can be performed 8 hours per aisle? (7 points)

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7. (5 points) What is AS/RS and Carousels?

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8. (5 points) What is difference between production system and manufacturing system?

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9. (10 points) Explain the function of computer control system in the manufacturing system and give an example for each function.

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10. (20 points) Answer the following question.

10.1 (5 points) What is flexible manufacturing system?

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10.2 (5 points) What is Group manufacturing system?

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10.3 (5 points) What is Computer Integrated manufacturing system?

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10.4 (5 points) What is difference between FMS and CIM?

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11. (25 points) From the class presentations, answer these following questions?

11.1 (3 points) From Beer Manufacturing case study, what is process shown that the system is CIM?

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11.2 (3 points) From KFC case study, what is AGV type for the system? In addition, how is the AGV system controlled ?

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11.3 (4 points) From Ice-cream case study, what are processes improved for the CIM system and how do they improve?

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11.4 (4 points) From Coffee Maker case study, explain how the system is FMS.

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11.5 (4 points) From Big C case study, what is the automated material handling equipment? Explain how it works from the beginning to final destination?

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11.6 (3 points) From Rubber case study, what are material handling activities of the automated material handling system? In addition, what are automated handling equipments for these activities?

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11.7 (4 points) What are case studies for AS/RS? Explain all case studies

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