PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Final Examination : Semester 2 Academic Year : 2005

Date : March 1, 2006 Time : 9.00-12.00

Subject: 226-532 Manufacturing Automation Room: R300

Direction

• There are 3 questions. The total score is 100.

• Write your own answer on the exam papers.

• All materials, books, calculators are allowed.

Assist. Prof. Wanida Rattanamanee

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1	30	
2	30	
3	40	
รวม	100	



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1. (30 points) In the para-wood furniture manufacturing, there are many processes
which are recieving the rubber-wood, cutting to the pieces of wood, vacuuming the
lumber, drying the vacuumed lumber, shaping the lumber, assembling to the
furniture and packaging. From these processes, you have to design the automated
material handling system for the factory. In general, the para-wood furniture
manufacturing is kind of job-shop system (the process layout).
1.1 Which are the factors effected to the automated material handling system?
Explain how they affect to the system. (15 points)
1.2 What kind of automated material equipment for the system? Explain how they
can work the system. (15 points)

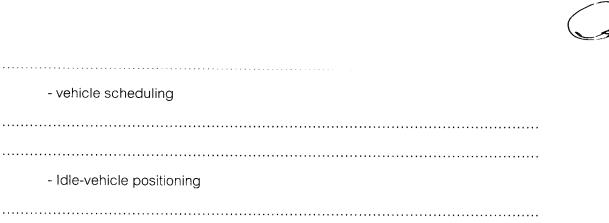


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- 2. (30 points) Consider an AS/RS with dedicated storage/retrieval machine per aisle, eight aisles in the whole system. Information regarding the system is as given below:
 - 2.1 unit load data: height of a unit load = 50 in., high clearance of the unit load in the slot = 10 in., width of a unit load = 50 in., wide total clearance of the unit load in the slot = 8 in., length of a unit load = 40 in., high total clearance of the unit load in the slot = 6 in.
 - 2.2 two feet wide aisles separate racks from the side walls and one end of wall of the structure
 - 2.3 length of a storage aisle = 80 unit loads
 - 2.4 height of a storage aisle = 12 unit loads
 - 2.5 height between top level of rack and building ceiling = 20 in.
 - 2.6 aisle length of 20 ft. is required in front of the system to support the P/D stations and other material handling devices used for delivering and removing loads from the AS/RS. The P/D station is located at the end of the S/R aisle.
 - 2.7 Pick up or drop off time per unit load = 0.20 min
 - 2.8 Average system horizontal and vertical travel speed are 300 ft./min and 50 ft./min respectively.
 - 2.9 60% of the storages and retrievals are done under single command cycle. 40% of the storages and retrievals are performed under dual command cycles.
 - 2.10 It is intended that 200 storages and 200 retrievals are to be performed 8 hours per aisle. Each aisle has a dedicated S/R machine.

Determine:

- Q-1 What is the minimum space requirement (Volume) of the AS/RS system?(10 points)
- Q-2 Can the S/R machine handle the handling workload over the eight hours? (10 points)
- Q-3 If the answer of Q-2 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? (10 points)



- battery management



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3. (40 points) Explain the following topics by short answers for each.	
3.1 (10 points) What is a climbing cleaning robot?	
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3.2 (10 points) A presented paper was a review on design and control of automate	€G
guided vehicle systems. Explain about the following topics.	
- guide-path design	
- determining vehicle requirements	
- vehicle scheduling	
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- Idle-vehicle positioning	
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- battery management	
- vehicle routing and deadlock	



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	modular cell in AS/RS" paper?
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3.4	(10 points) Explain about these manufacturing systems and how can automation
	systems be applied for the manufacturing systems?
	- Group technology
	- Cell manufacturing
	- Kaizen
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	- Just in time
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