Midterm Examination : Semester 2   Academic Year : 2006
Date : December 23, 2006   Time : 9.00-12.00
Subject : 226-431 Manufacturing Automation System   Room : R200

Direction

- There are 10 questions. The total score is 100.
- Write your own answer in to the exam paper.
- All materials, books, calculators are allowed.

Assoc. Prof. Wanida Rattanamanee

Name...Code.............................

Question	Full Scores	Assigned scores
1	5	
2	5	
3	10	
4	10	
5	10	
6	20	
7	5	
8	15	
9	5	
10	15	
รวม	100	

ทุจริตในการสอบ โทษขั้นต่ำ คือ พักการเรียน 1 ภาคการศึกษา และปรับตกในรายวิชาที่ทุจริต

GOOD LUCK
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1. Explain the relationship between product quantities and facility layouts? (**5 points**)

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2. In the industrial engineering department, what are the system facilities and support systems. (**5 points**)

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3. How many basic types of automated manufacturing systems can be classified? Explain and give some examples of each type. (**10 points**)

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4. What are the statements of the USA principle? Explain and give some examples. **(10 points)**

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5. The break-even point is to be determined for two production methods, one a manual method and the other automated. The manual method requires two workers at $9.00 / hr. each. Together, they produce at a rate of 36 units/hr. The automated method has an initial cost of $125,000, a 4 year service life, no salvage value, and annual maintenance costs = $3000. No labor (except for maintenance) is required to operate the machine, but the power required to run the machine is 50 kW (when running). Cost of electric power is $0.05/kWh. If the production rate for the automated is 100 units/hr., determine the break-even point for the two methods, using a rate of return = 25%. If the plant would like to produce 2000 units per month, which method should be selected? **(10 points)**

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6. An average of 20 new orders is started through a certain factory each month. On average, an order consists of 50 parts to be processed through 10 machines in the factory. The operation time per machine for each part = 15 min. The nonoperation time per order at each machine averages 8 hr., and the required setup time per order = 4 hr., There are 25 machines in the factory, 80% of which are operational at any time (the other 20% are in repair or maintenance). The plant operates 160 hr./month. However, the plant manager complains that a total of 100 overtime machine-hours must be authorized each month to deep up with the production schedule.

    6.1 What is the manufacturing lead time for and average order? (**5 points**)

    6.2 What is the plant capacity (on a monthly basis) and why must the overtime be authorized? (**5 points**)

    6.3 What is the utilization of the plant according to the definition given in the text? (**5 points**)

    6.4 Determine the average level of work-in-process (number of parts-in-process) in the plant. (**5 points**)

7. What is the meaning of manufacturing automation? **(5 points)**

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8. What is a problem of Thai manufacturing process in your idea? How can you solve the problem by manufacturing automation theories? **(15 points)**

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connected to the leadscrew using a 5 : 1 gear ratio (5 turns of the motor converts to 1 turn of the leadscrew). The motor has 180 steps per revolution. To execute a certain programmed instruction, the table must be moved from point (3.5, 1.5) to point (1.0,7.2) at a speed of 10 in./min. Determine (a) the number of pulses to control the x axis, (b) the rotational speed of the motor, and (c) the pulse rate **(15 points)**

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9. Describe accuracy and repeatability of the CNC machine system. (**5 points**)

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10. A stepping motor is used to drive the x axis of a NC milling machine table. The motor is coupled directly to the table leadscrew, which has 4 threads/in. It is connected to the leadscreaw using a 5 : 1 gear ratio (5 turns of the motor converts to 1 turn of the leadscrew). The motor has 180 steps per revolution. To execute a certain programmed instruction, the table must be moved from point (3.5, 1.5) to point (1.0,7.2) at a speed of 10 in./min. Determine (a) the number of pulses to control the x axis, (b) the rotational speed of the motor, and (c) the pulse rate (**15 points**)

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