

PRINCE OF SONGKLA UNIVERSITY FACULTY OF ENGINEERING

Midterm Exam Second Semester Date 1 May 2016 Course 225-554 Automation Manufacturing Academic Year 2016 Time 9:00-12:00 Room Robot

ทุจริตในการสอบ โทษขั้นต่ำ คือ พักการเรียน 1 ภาคการศึกษา และปรับตกในรายวิชาที่ทุจริต

Instructions

- 1. There are a total of 9 questions and 100 points.
- 2. Answer the questions in an answer book provided.
- 3. Only dictionaries are allowed.

Supapan Chaiprapat

- 1. (10 points) Process planning is one of the most important activities in a product cycle. What are inputs and outputs of this activity? Give details.
- 2. (5 points) CAPP technology emerged from incapability of human in process planning. List drawbacks of manual planning that CAPP can overcome. Also give example.
- 3. (10 points) *Variant* and *Generative* are widely known CAPP approaches. What situation may *Variant* be more preferable than *Generative* and vice versa? Also give example.
- 4. (10 points) From the Opitz code in Figure 1 below, answer the following questions.
 - a. (5 points) What type of this code? (mono or poly) Explain.
 - b. (5 points) What is the Opitz code (first 5 digits) of this part in Figure 2?

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Figure 2

- 5. (5 points) What are the main components of a CNC machine and their functions?
- 6. (25 points) CNC problems
 - a. (5 points) A CNC machine is commanded to move from A to B. If A is positioned at (5,3) and B is at (9,1), how many Basic Length Unit (BLU) needed to move from A to B if 1 BLU = 0.001 for both axes?
 - b. (10 points) If a pitch of the leadscrew is 0.3 and one revolution of the stepping motor is driven by 1,200 electrical pulses, what is the machine resolution?
 - c. (10 points) If you want to build a CNC machine with BLU = 0.0001 and a stepping motor is driven by 2,000 pulses per revolution, when there is 1:4 gear ratio between the motor and the leadscrew, what is a pitch of the leadscrew?
- 7. (20 points) In the following <u>automated</u> manufacturing line, determine suitable <u>material</u> <u>handling equipment and unitizing equipment</u>.
 - Aluminum parts manufactured by this production line are changed every week.
 Parts' dimensions are no greater than 2x5x1 in. They need to go through 5 manufacturing stations. Production volume is 50,000 weekly. Product shipped in a package of 10 parts.
 - b. It is a line of a steel product of moderate size (12x15x20 in approx.). A manufacturing line is designed specifically for this product. Production volume is 150 daily.
 - c. From b, if the parts are as small as a tennis ball, and production volume is increased to be 2,000, do you insist on the same answer?
 - d. A seafood processing line has a production capacity of 2 tons daily. Products are of limited types and only slight difference in processing details among them. Products are shipped in a package of 12 pieces.
- 8. (10 points) Design a furniture factory of the future. Explain roughly activities in each step of a product cycle starting from Need Forecast through Market.
- 9. (5 points) You have previously reviewed automated systems related to your thesis. Choose one of them and explain how it works.

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