PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Midterm Examination: Semester I

Date: August 5, 2010

Subject: 226-302 Computer Aided Manufacturing

Academic Year: 2010

Time: 13:30-16:30

Room: A400, 5 102

Instructions

- Write your answer in this exam paper only, show your work clearly and legibly.
- **Allow only 1 page of A4 with your own handwriting and submit along with the exam paper.**
- Write your name and student ID on every page of the exam paper.
- Dictionary and calculator are allowed.
- There are 10 questions and one bonus. Total score is 180.

ทุจริตในการสอบ โทษขั้นต่ำ คือ พักการเรียน 1 ภาคการศึกษา และปรับตกในรายวิชาที่ทุจริต

Name ....   Student ID ....

Question #	Full Score	Assigned Score	Question #	Full Score	Assigned Score
1	6		6	4	
2	6		7	10	
3	10		8	10	
4	6		9	10	
5	6		10	12	
			BONUS	10	
			TOTAL	80+10	

Good Luck

Thanate Ratanawilai

1. (6 points) What improvements do CNC machines offer over traditional NC machines?

   _____

   _____

   _____

2. (6 points)

   a. What are machine axes?

   _____

   _____

   _____

   b. A spindle movement is primarily along the _____ axis.

   c. Table movement for most milling machines are along the _____ and _____ axes.

3. (10 points) Match the terms on the left with the definitions on the right:

   ____ Character   (a) A letter describing the meaning of a number following the letter

   ____ Address   (b) A sequence of blocks

   ____ Word   (c) Alphanumeric or punctuation mark

   ____ Block   (d) An address followed by a number

   ____ Program   (e) A complete command to the CNC machine

4. (6 points) Explain each types of chip produced during metal cutting.

   _____

   _____

   _____

   _____

   _____

   _____

   _____

5. (6 points) Tool life can be almost infinite at low cutting speed. Would you recommend that all machining be done at low speed? Explain any limitations on doing so.

   _____

   _____

   _____

   _____

   _____

   _____

6. (4 points) Based on the classification of chip shape by Sumitomo Electric (Figure below), please indicate the most favourable and unfavourable chips (A, B, C, D, and E) and give the reasons to support your answer.

Depth of Cut	A	B	C	D	E
Excess					
Slight					
Curled Length	No Curling	Over 50mm	Up to and including 50mm 1 to 5 Turns	Below 1 Turn	Half Turn

Most favourable chips:_____

Reson:_____

_____

Most unfavourable chips :_____

Reson:_____

_____

7. (10 points) Explain the features of different kinds of tool wear.

_____
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8. (10 points) Explain temperature distributions in metal cutting where the heat was generated and transferred to. Draw figure to demonstrate your answer and identify the area of highest temperature.

9. (10 points) Using the Taylor's tool life equation for tool life and letting n = 0.5 and C = 400, calculate the percentage increase in tool life when the cutting speed is reduced by 50 percent.

10. (12 points) A 6-in. diameter carbide milling cutter is to be used to cut medium hard steel, as shown in figure below, with a feed of 0.008 in./rev. and cutting speed is 180ft./min. If the depth of cut is to be 0.050 in. and the length of cut is 8 in., calculate:
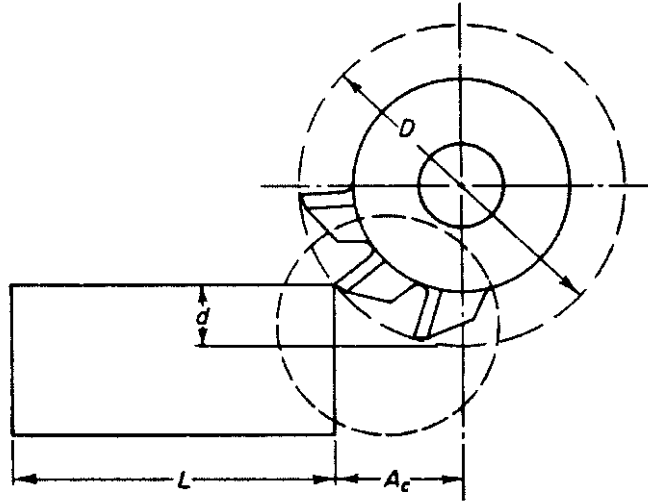
a. The rev/min.

b. The approach.

c. The time to take one cut.

BONUS (10 points)

In the single edge orthogonal machining on mild steel, the results were found as follows:

Width of chip = 2.5 mm,   Undeformed chip thickness = 0.25 mm,

Chip thickness = 0.75 mm,   Chip-tool contact length = 0.5 mm,

Working normal rake = 0°,   Cutting force = 900 N,

Thrust force = 450 N,   The mean chip-temperature rise 500°C

For the properties of mild steel,   Density = 7 200 kg/ m3,

Specific heat capacity = 502 J/kgK,   Thermal conductivity = 43.6 J/s m K

Calculate

     a.   The shear angle

     b.   The mean shear strength of the work material (MN/m2)