PRINCE OF SONGKLA UNIVERSITY

FACULTY OF ENGINEERING

Midterm Examination: Semester II	Academic Year: 2007
Date: December 27, 2007	Time: 09:00-12:00
Subject: 226-308 Modern Manufacturing Processes	Room: A201, A203

Instructions

- Write your answer on the answer book only, show your work clearly and legibly.
- Double sides of A4 (with your own hand-writing and no photocopy), dictionary, and calculator are allowed.
- Write your name and student ID on the exam paper and A4, **submit all materials**.
- There are 15 problems and total score is 120 (25%).

ทุจริตในการสอบ โทษขั้นต่ำ คือ พักการเรียน 1 ภาคการศึกษา และปรับตกในรายวิชาที่ทุจริต

Name ..... **Student ID** .....

Good Luck

Thanate Ratanawilai

1 (5 points) Describes the events that occur when a specimen undergoes a tension test. Sketch a plausible stress-strain curve and identify all significant regions and points between them. Assume that loading continues through fracture.

2 (20 points) Assume that the following data are taken from a high carbon steel tension test specimen. The original area of the specimen is 0.05 in^2, final (fracture) area is 0.02 in^2 ad original length is 2 in.

Load, P (lb)	Δ length (inch)
1200	0
2000	0.02
2500	0.08
3100	0.20
3800	0.40
4100	0.60
4200 (max)	0.86
2900 (fracture)	0.98

2.1 Compute ultimate engineering tensile stress.

2.2 Compute true stress when the area of specimen is 0.035 in^2.

(Hint: $A_0L_0 = AiLi$)

2.3 Compute engineering strain at break of the test specimen.

2.4 Compute true strain when the length of specimen is 2.4 in.

3 (5 points) Identify all the force in a cutting operation. Which force contributes to the power required?

4 (5 points) What determine the type of chip? Explain

5 (5 points) Explain the features of different kinds of tool wear.

6 (5 points) Is there any advantage in having a built-up edge? Explain.

7 (5 points) Are the location of maximum temperature and crater wear related? If so, why?

8 (5 points) Tool life can be almost infinite at low cutting speeds. Would you recommend that all machining be done at low speeds? Explain any limitations of doing so.

9 (5 points) What are the effects of performing a cutting operation with a dull tool?

10 (5 points) Explain whether having a high or low n value in the Taylor tool-life equation is desirable. How about the value of C?

11 (5 points) Why does temperature have such an important effect on the life of cutting tools?

12 (5 points) Based on the research entitled "Investigation on optimum cutting conditions in turning of para wood using ceramic tools", what is the most effective parameter on the surface roughness of para wood in turning?

13 (5 points) Explain wear mechanism of ceramic tool.

14 (20 points) In a turning process on a lathe, the AISI 1045 steel rod with the length of 12 in. and the diameter of 3 in. is being turned to reduce the diameter to 2.98 in. The cutting tool is moving forward along feeding direction at an axial speed of 0.35 mm/sec and the spindle is rotating at 500 rpm.

14.1 Calculate the linear cutting speed at outer diameter.

14.2 What is the material removal rate?

14.3 Calculate the machining time for only cutting length of 8 in.

14.4 How many material removals in this work if the total length is 12 in?

15 (20 points) In the industrial engineering machine shop, metal was cut orthogonally with a tool of zero rake angle. Where a specific cutting energy of metal is 2.8 GN/m^2, density is 7200 kg/m^3, specific heat capacity is 500 J/kgK, mean coefficient of friction on the tool face is 1.0, cutting ratio is 0.2, and 10 percent of the shear zone heat is conducted into the workpiece.

15.1 Calculate the mean shear-zone temperature rise θs.

15.2 What would be the value of θs if the cutting speed were doubled and the proportion of shear-zone heat conducted into the workpiece remained the same?