Prince of Songkla University
The Faculty of Engineering

Midterm Examination Semester 1   **Academic Year 2005**

Date :   30/07/05   **Time : 09:00-12:00**

Subject : 226-409 Production Technology III   **Room   : A401**

ทุจริตในการสอบ โทษขั้นต่ำคือ ปรับตกในรายวิชานั้น และพักการเรียน **1** ภาคการศึกษา

DIRECTIONS

1. Only short note on an A4 piece (both sides), dictionary and calculator are

    allowed.

2. 9 questions are given on 4 pages and must be done.

3. Total score is 100.

4. Your answers could be in English or Thai.

5. Please check all questions before start working.

Good Luck

Asst.Prof.Dr. Angoon Sungkhapong

1. 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 and original length is 2 in.

Load, P, (lb.)	Δlength
1,200	0
2,000	0.02
2,500	0.08
3,100	0.2
3,800	0.4
4,100	0.6
4,200 (max)	0.86
2,900 (fracture)	0.98

Question: 1.1) Compute true strain when the length of specimen is 2.4 in. (5 points)

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

[Hint: AoLo = AiLi] (5 points)

2. How many kinds of cutting tool materials used for machining operations? Describe the important properties of each.   (10 points)

3. 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 turning 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.

a) Calculate the linear cutting speed at <u>outer diameter</u> and <u>machined diameter</u>. (5 points)

b) What is the material removal rate? (5 points)

c) Calculate the cutting time for only <u>cutting length of 8 in</u>. (5 points)

d) How many material removal in this work (total length is 12 in.)? (5 points)

4. According to Figure 1, a) Prove that $V / \cos(\emptyset - \alpha) = V_c / \sin \emptyset$. (10 points)

   b) How much V_c changes (in percentage) if $\emptyset$ is increased

   from 15° to 20° while α is fixed at 6° and V is fixed at
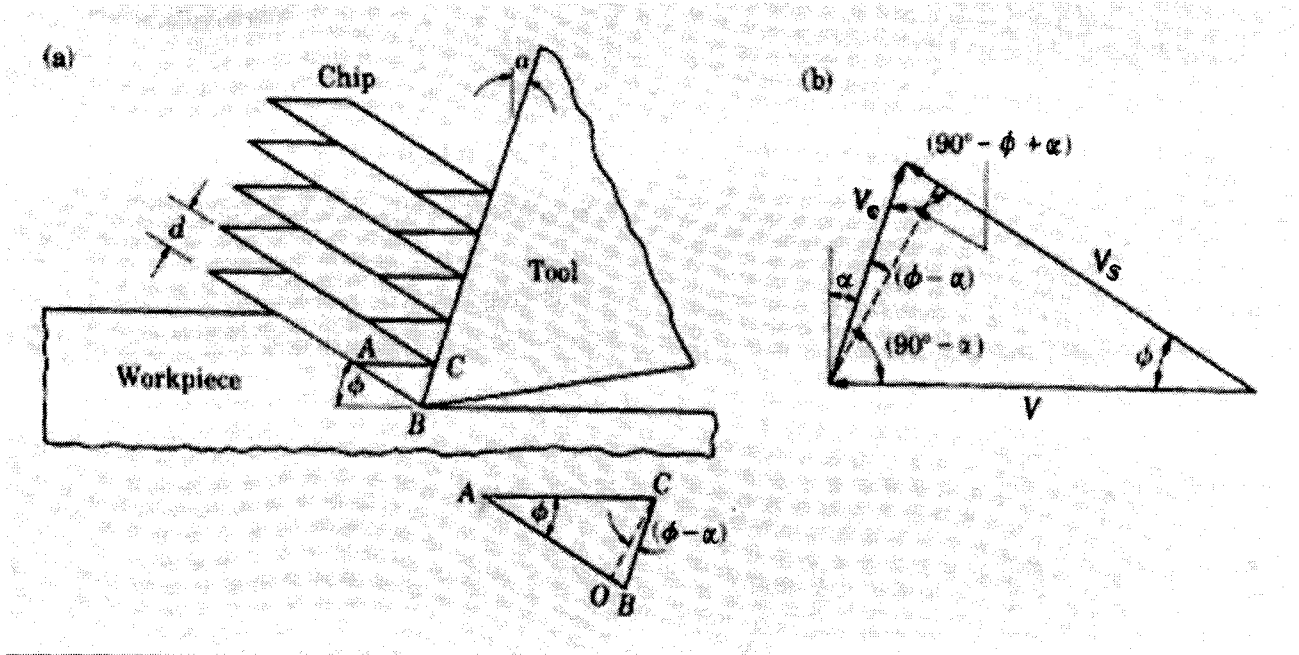
   200 m/min.? (10 points)

Figure 1: Show orthogonal cutting model

5. From the true stress – strain curve, what does n (the strain hardening exponent) indicate the

properties of the specific material ? Explain. (10 points)

6. According to Figure 2, a) Put the name of cutting force in each direction. (5 points)

   b) Which kind of force show an essential effort on Flank Wear
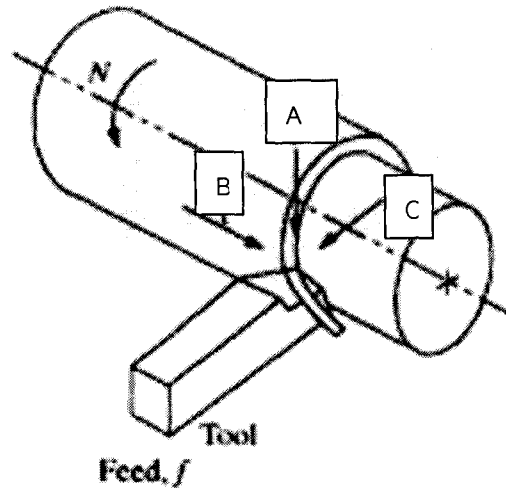
   occurring? How?(5 points)

(b)

Figure 2: Show the force directions in turning process

7. According to the data shown in the figure 3, how does the cutting temperature affect to crater wear occurring? (5 points)
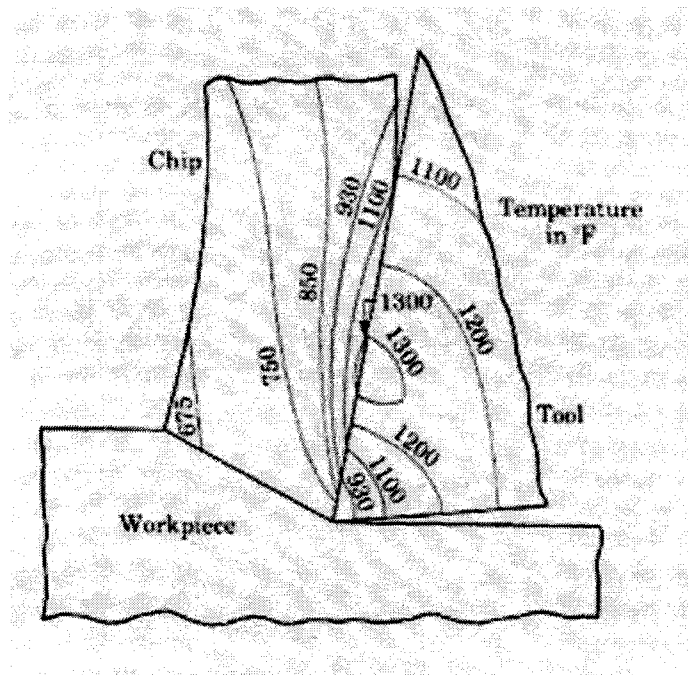

Figure 3: Cutting temperature in cutting process.

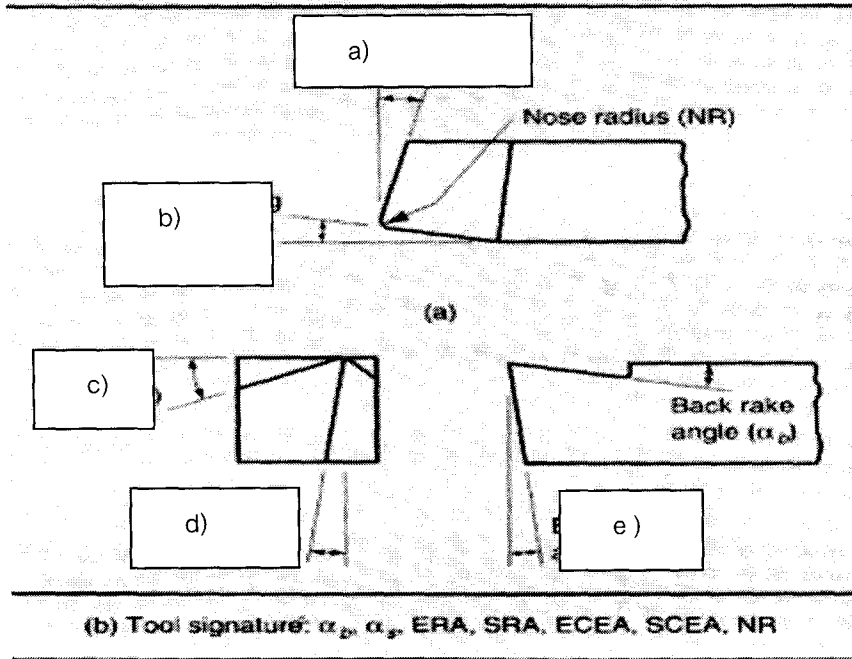8. What is the name of each angle shown in figure 4? (10 points)

a)

Nose radius (NR)

b)

(a)

c)

Back rake angle (α_b)

d)

e)

(b) Tool signature: α_b, α_s, ERA, SRA, ECEA, SCEA, NR

Figure 4: Show tool geometry of cutting tool.

9. How does coolant decrease tool deterioration rate? Explain. (5 points)

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