Prince of Songkla University

Faculty of Engineering

Final Examination : Semester 2 — Academic Year : 2007

Subject : 226 – 308 Modern Manufacturing Processes — Time : 13.30 - 16.30

Date : February 27, 2008 — Room : R201

ทุจริตในการสอบ โทษขั้นต่ำคือปรับตกในรายวิชาที่ทุจริต และพักการเรียน 1 ภาคการศึกษา

- There are 7 questions in 4 pages.
- Answer all questions in the answer-book provided.
- Only *a short-note of size A4 (written in own hand-writing)*, a dictionary (**not** a talking dictionary) and a calculator without programming capability are allowed.
- Total marks are 100. (30%)

Name:	Student ID.....

Question #	Full Score	Assigned Score
1	**25**	
2	**20**	
3	**10**	
4	**10**	
5	**15**	
6	**10**	
7	**10**	
Total	**100**	

Assoc. Prof. Somchai Chuchom

Question 1 (25 marks) Briefly answer the following questions.

1.1 Characteristics required of electrode materials used in wire-cut EDM are

a)

b)

c)

1.2 The dielectric fluid used in the wire-cut EDM process serves functions:

a)

b)

c)

1.3 Metal removal rate for EDM is dependent on factors:

a)

b)

c)

1.4 Limitations of EDM are

a)

b)

c)

1.5 Applications of waterjet machining are

a)

b)

c)

1.6 What is Kerf width? How is it important in the abrasive waterjet cutting?

1.7 In laser machining, there are two main types of lasing medium:

a)

b)

1.8 List three advantages of laser cutting.

a)

b)

c)

Question 2 (20 Marks)

An order of 900 pieces of AISI 1045 carbon steel is to be produced by fine turning. Only one pass of cut per piece is required. The finished part is 80 mm in diameter and 250 mm long. Apply the carbide tool of tool life follows the equation $T = 1.06x10^{8}v^{-2.5}$, where T = tool life (min) and v = cutting speed (m/min).

The tool costs 270 Baht per tip, the operating cost (include labor cost) is 70 Baht/hr. The machine depreciation is calculated at 250 Baht per one hour of machining. Other expenses are assumed negligible. The loading and unloading time per piece is 1.5 min. Tool change per tip is 3.0 min.

a) calculate the optimum cutting speed;

b) calculate the appropriate spindle speed;

c) calculate the tool life;

d) calculate the total machining time of the order;

e) calculate the total cutting cost of the order;

f) Suppose the cutting speed obtained in a) exceeds the limits of your machine in use, you consider a new setting for cutting speed. Specify all information needed (not given here) to calculate the optimum cutting speed for minimum cost per piece.

Question 3 (10 Marks)

During the laser cutting process, they occur five main phenomena at the material surface and layers. Specify them and briefly discuss the effect of each.

Question 4 (10 Marks)

4.1 CO_2 laser used one of the many modes of molecular vibration to generate the monochromatic light beam. *If the CO_2 molecule can be represented by the following picture, use the picture to explain 3 different ways that vibration can take place.*

Oxygen Carbon Oxygen

4.2 In a He-Ne laser, Ne is known to be the luminant that releases light energy. *What is the role that He plays in the light emission process ?*

Question 5 (15 Marks)

Sketch a picture to demonstrate the concepts and functions of the Non-conventional Machining process (or the topic) you were assigned in the class. Specify the factors and their effects on the cutting rate. Also discuss the advantages and disadvantages of this process when apply in material cutting.

Question 6 (10 Marks)

6.1 What is the Salomon Curve? Why is it important?

6.2 Explain the concepts/ideas in cutting tool design for high speed machining. What are the reasons behind them?

Question 7 (10 Marks)

Identify the reasons that make a manufacturing company turn itself into a CIM company. What tasks in manufacturing which need to be integrated? How the integration can be put into practice.

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