

PRINCE OF SONGKLA UNIVERSITY
FACULTY OF ENGINEERING

Final Examination: Semester 1

Academic Year: 2003

Date: September 30, 2003

Time: 9.00-12.00

Subject: 226-401 Machining Technology

Room: R200

Instructions

- There are 6 questions in 8 pages.
- Answer all questions in this exam paper.
- Dictionary and a calculator without programming capability are allowed.
- *A short-note of size A4 (both sides) written in own hand-writing is allowed, and must be submitted with the exam paper. (Duplicated note is not allowed)*
- Total score is 105.

| | |
|-------------|-----------------|
| Name: | Student ID..... |
|-------------|-----------------|

| Question # | Full Score | Assigned Score |
|--------------|------------|----------------|
| 1 | 15 | |
| 2 | 20 | |
| 3 | 25 | |
| 4 | 15 | |
| 5 | 15 | |
| 6 | 15 | |
| Total | 105 | |

Asst. Prof. Somchai Chuchom

Question #1 (15 marks)

Analyze and compare the principal concepts, process components and its applications of the following machining techniques.

1.1 Ultrasonic Machining (UM) VS Electric Discharge Machining (EDM)

1.2 Abrasive Jet Machining (AJM) VS Water Jet Machining (WJM)

1.3 Electrochemical Machining (ECM) VS Electron Beam Machining (EBM)

Question #2 (20 marks)

Give a short answer for each following question.

2.1 Most accepted laser types for industrial material cutting are:

a).....

b).....

2.2 The main problems of applying continuous mode lasers when compared to pulsed mode lasers are

.....

2.3 The lasant gas for Ion-laser which can generate high power pulse for metal cutting is

2.4 The main problems of applying CO₂ laser on *Al* workpieces are

.....

2.5 Laser that is generated from organic materials and can be tuned for several wavelengths is

2.6 Nd-YAG laser : advantages are

.....

2.7 Nd-glass laser : limitations are

.....

2.8 Excimer laser : suitable work applications are.....

.....

2.9 Why cutting forces in laser assisted machining are lower than those of conventional cutting processes?

.....

2.10 In academic point of view, discuss the potential success and development of Nd-Glass laser.

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Question #3 (25 marks)

An order of 850 pieces of AISI 1015 carbon steel are to be produced by fine turning. Only one pass of cut per piece is required. The finished part is 125 mm in diameter and 300 mm long. Apply the cermet tool of tool life follows the equation $T = 1.02 \times 10^8 v^{-3.2}$, 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 50 Baht/hr. The machine depreciation is calculated at 180 Baht per one hour of machining. Other expenses are assumed negligible. The loading and unloading time per piece is 1.05 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 to have a new setting for cutting speed. Specify all information (not given here) needed to calculate the optimum cutting speed for minimum cost per piece.

Name.....ID.....

Question #4 (15 Marks)

4.1 Identify the reasons that make a manufacturing company to turn itself into a CIM company.

4.2 If a company decides to implement CIM in its organization, what guidelines would you recommend the MD to successfully implement the system.

4.3 Explain in detail of what should be integrated in manufacturing systems of the company and what are required to make the integration successful.

Question #5 (15 Marks)

5.1 There are five main units of the plastic injection machine. Specify each of them, and also explain in detail the function of each unit.

5.2 Sketch the molding system for plastic injection machine (at least show the Standard Mold Base, the core and cavity, and the ejector system).

Question #6 (15 Marks)

6.1 What are the advantages of high speed cutting? How the tool life in high speed cutting is measured?

6.2 Why the Salomon Curve was mentioned and interested by the researchers in 1930s?