Exam in Modern Manufacturing Processes MPR 033

Date: 2008-10-24

Time: 14.00-18.00

Examiner: Gustav Holmqvist, tel. 5026, 0709-393275

Will visit the exam about 15.00 and 16.30.

Ass. Devices: Approved calculator, pen, pencil, eraser, ruler, and written dictionary.

Credit list: The results will be reported in so that your results are available in the student portal on Nov 14.

Checking: Checking of your exams can be made Nov 17, 12.30-13.15, in room Delta in the study-hall.

Grading Fail: 0-19,5p, 3: 20-29,5p, 4: 30-39,5p, 5: 40-50p

ECTS grading: Fail**:** 0-19,5p, E: 20-22p, F: 22,5-28p, C:28,5-34p, B: 34,5p-43,5p, A: 44-50p

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General instructions: For full point you must make clear that you have understood the meaning of your answer. You must show the teacher that you have understood the question and it's answer. Make sketches when appropriate to explain yourself. Write clearly and readable. Good Luck!

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1. Functional surfaces and topography (4 p)

a) Give three different examples of functional surfaces produced by manufacturing processes. Name the functions and the processes. (1,5 p)

b) What is the Abbot-Firestone curve? Answer by explaining how the curve is made up (you do not need to make a mathematical explanation). In what area is this a valuable way of analyzing a surface? (2,5 p)

Metal forming

2. Drawing – tool design (5 p)

When a tool is to be designed for deep drawing there are some technical issues (geometrical for instance) that have to be taken into consideration. In the literature this is also denoted as drawing practice. List five of these important issues and discuss how they will affect the final result of the drawn part. (5p)

3. Fine blanking (5 p)

Describe the technique fine blanking. Compare it to conventional punching and list its advantages and drawbacks. The answer should also contain information about when it is used. (5p)

4. Hydroforming (4 p)

a) The process chain for a hydroformed part includes, besides hydroforming, two other steps. Which are the two other steps? Give also one example of process for each step. (1 p)

b) Why and how will wrinkling occur in hydroforming? Describe also how wrinkling is avoided or minimized. (3 p)

Unconventional machining methods

5. Abrasive Waterjet Cutting (5 p)

a) What should you consider when designing parts for abrasive waterjet cutting? Four different issues should be mentioned and explained. (4 p)

b) Water mass flow rate is a parameter in Zeng and Kims formula. Mention one advantage of *increasing* this parameter as well as one disadvantage. (1 p)

6. Laser Cutting (4 p)

Laser light is different than ordinary light (from for instance a light bulb). Mention three characteristic properties of the laser radiation. Why are these characteristics important in the context of a laser in manufacturing? (4 p)

7. Plasma cutting (3 p)

Explain the concept of dual gas plasma cutting. Also give at least two examples of gases that are used. (3 p)

8. Electrical Discharge Machining (4 p)

a) Mention at least four advantages of EDM. Each advantage should be formulated as a sentence. You can compare to a specific process or answer in general (as the literature does). (2 p)

b) What are the functions (purposes) of the dielectric fluid in EDM? (2 p)

Metal Cutting

9. Grinding and hard turning (7 p)

a) Grinding wheels will wear. Mention and explain the three main mechanisms of wear. (3 p)

b) Shortly explain truing and dressing of grinding wheels. Be sure to point out the difference between the two. (2 p)

c) What advantages does grinding have over hard-turning? Shortly explain two advantages or mention four advantages. (2 p)

10. Metal Cutting Fluids (5 p)

a) Explain briefly how heat is created in a metal cutting process such as turning. Also make a sketch including a tool edge and indicate the point of highest heat. Be sure that the sketch is understandable in terms of material and chip direction. (2 p)

b) What does the medium used in MQL contain? (No exact amounts need to be mentioned). (0,5 p)

c) Discuss briefly how MQL can have an influence on
- temperature
- cutting force (2,5 p)

11. High-Speed Machining (4 p)

HSM should be considered as a system; a number of different things need to be changed, as compared to conventional machining, in order to make HSM a productive method. Discuss what different parts of the system must be altered, how and why. (4 p)