

Exam in Manufacturing Processes MPR 034

Date:	2012-10-25
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:	Will be sent out by e-mail 2012-11-14
Checking:	Checking of your exams can be made 2011-11-16, 12.30-13.15, Room Gamma in the study hall.
Grading	Fail: 0-19,5p, 3: 20-29,5p, 4: 30-39,5p, 5: 40-50p

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 its answer. Write detailed answers and motivate and explain yourself. Write clearly and readable. Please do not use ink pen. Good Luck!

Unconventional machining methods

1. Abrasive Waterjet Cutting (5 p)

a) From the perspective of a designer (of mechanical parts) – what optimisation/adaption should you make to your design so that it is cut quickly? Point out at least four things and explain how and why they affect manufacturing time. (4 p)

b) From the same perspective point out two disadvantages of AWJ and very briefly explain them (do not just give the disadvantages; write at least a sentence on each thing). (1 p)

2. Thermal methods - Laser cutting and EDM (5 p)

a) LASER: Describe a cutting head for laser cutting (make a sketch). There are typically three separate “functions” or parts in a cutting head. What are these and what are the functions of each. Details on the interactions with the work-piece are not necessary. (3 p)

b) EDM: Briefly discuss how the machined surface is “made” (what produces the surface “pattern”) and also give some example of how the surface finish could be controlled in EDM. (2 p)

Metal forming

3. Sheet metal forming (6 p)

a) Two “types” of anisotropy is of importance in forming. Which are these? Define them and discuss their role and importance. (4p)

b) Lubrication plays an important role in forming. How was that noted in the lab (or how is that noted in a deep drawing application)? Why do we find this effect of lubrication? (2p)

4. High-strength materials and shearing (blanking/punching) (5 p)

a) How will the sheared surface of a high-strength steel be different from that of a mild steel? Point out making a sketch of a surface and briefly explain. (2p)

b) Discuss the particular attention that comes with high-strength steels when selecting *die clearance*. How does the die clearance affect the wear of the dies and the surfaces? (3 p)

5. Hydroforming (3 p)

For hydroforming (with a tubular starting object) describe *in words*:

- Why and how wrinkling occurs
- Why and how fracture (cracks) occurs.

(You may of course add some figure to your answer if you want to).

Metal Cutting

6. Grinding (5p)

a. What is the G-ratio in grinding? And why is it of economical importance? (1,5 p)

b. What is dressing and truing? Briefly explain what it is and how it is made. Point out the difference. (You do not need to explain all different mechanisms). (2,5 p)

c. Comment on the relationship between dressing/truing and G-ratio. How would you include dressing and truing in the G ratio? (1 p)

7. Metal Cutting Fluids (5p)

a. What are the functions of cutting fluids? Explain briefly each point/function (one sentence per function). (2,5 p)

b. In what ways can alternative cutting fluids have advantages from a sustainability approach? Are there as well disadvantages?

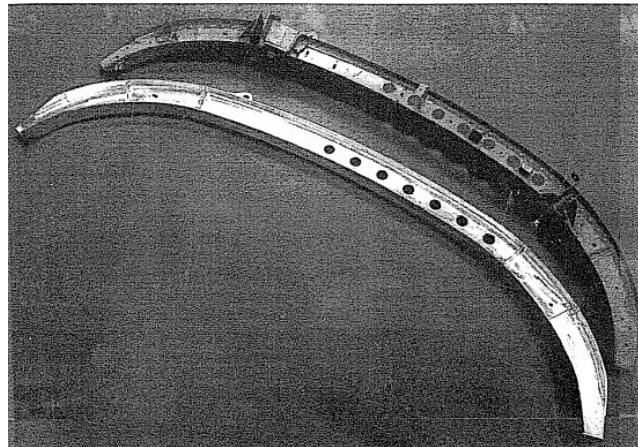
“Alternative” means not flooding with conventional cutting fluids. One or several types or different ways of applying the fluids may be discussed. (2,5 p)

8. High-Speed Machining (5p)

a) When implementing HSM one can not just buy some machine with high rotational speed and hope for the best. Describe at least two different things that have to be considered and how those “things” should be changed - before starting to work with HSM. Think for example of the tool, of parameter settings or things to check when buying the machine. (2 p)

b) Which type or types of cooling is recommended for HSM? Explain very shortly why this is the case. (1 p)

c) Below pictures exemplify an advantage of HSM in aluminium. What is the advantage and how is this beneficial? Explain also why we get this advantage! (2 p)



Joining

9 Soldering of SMT-components (4p)

Describe the full sequence for assembly of surface mount components to PCB:s. Describe all parts of the sequence (starting with a PCB without any components).

10. Laser welding (4p)

a) Point out a main important technical difference of welding as compared to cutting with laser. How does the cutting head set-up differ? (1 p)

b) Point out some (about three) important advantages of laser welding as compared to other joining methods. Try to point out over which process it has these advantages. (3 p)

11. Surface Topography (3p)

a) If measuring with a stylus - How can the tip of a stylus be used as a mechanical filter? (1,5 p)

b) What is the Abbot-Firestone curve (also called bearing ratio curve)? Answer by explaining how the curve is made up (you do not need to make a mathematical explanation). (1,5 p)