



UNIVERSITY
OF SKÖVDE

School of Engineering Science

WRITTEN EXAMINATION

Course: Alternative Manufacturing Methods, A1N

Sub-course: Written Examination

Course code: VP716A

Credits for written examination: 4 ECTS

Date: 2019-12-09

Examination time: 08.15-12.30

Examination responsible: Assoc. Professor, Dr Lennart Y. Ljungberg

Teachers concerned: Examiner, Dr Wei Wang

Aid at the exam/appendices: Only language dictionaries

Other: Assoc. Professor L.Y. Ljungberg can be contacted by telephone through the examination attendants.

- Instructions:
- Take a new sheet of paper for each teacher.
 - Take a new sheet of paper when starting a new question.
 - Write only on one side of the paper.
 - Write your name and personal ID No. on all pages you hand in.
 - Use page numbering.
 - Don't use a red pen.
 - Mark answered questions with a cross on the cover sheet.

Grade points:

Maximum: 20p

Not Passed < 8p

Grade E ≥ 8p

Grade C ≥ 12p

Grade A ≥ 16p

The intermediate grades will be determined by a formative assessment.

Examination results should be made public within 18 working days!

Good luck!

Total number of pages 2



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Part A. Short answers. Motivate your answers when possible. 1 p per task!

1. **Laser.** Explain two typical advantages of LBW (Laser Beam Welding) over EBW (Electron Beam Welding)!
2. **PM.** Describe two products made by Powder Metallurgy and why this technique is interesting for the products you mention.
3. **Nanoscale Manufacturing.** Explain the principle for manufacturing/micromachining of MEMS Devices (Micro Electro Mechanical Systems), like accelerometers or air-bag sensors.
4. **Jet Machining.** Discuss briefly how Water-jet Machining works.
5. **Material Structure.** Describe an amorphous atomic/molecule structure.

Part B. Detailed answers. Motivate your answers when possible! If possible draw figures, even when this is not required! 3 p per task!

6. **Materials Selection.** Explain the principles for materials selection in a product.
7. **Laser.** Describe 3 types of processes which can be performed with a laser equipment/process.
8. **Thermal Spraying/Coatings.** Describe 3 different types of advanced coating processes for materials.
9. **Electrochemical Machining.** Explain with text and figures the principles for Electrochemical Machining.
10. **Materials.**
 - a. Explain how a crystal in a polymer is built up with picture/pictures.
 - b. Explain how metals can be deformed referring to the crystal structure.
 - c. Explain chemically why ceramics are typically hard compared to e.g. metals.