

School of Engineering Science

WRITTEN EXAMINATION

Course: Alternative Manufacturing Methods

Sub-course: Written Examination

Course code: VP716A

Credits for written examination: 4 ECTS

Date: 2024-10-28

Examination time: 14.15-18.30

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 <10p

The exact grades (according to the course P.M.) will be determined based on the course objectives. (The notifications in brackets after some questions refers to the relevant chapters in the course book or Handouts!)

Examination results should be made public within 18 working days!

Good luck!

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

1. **Materials Selection.** Sometimes a material is not possible to use in a product even if it is the "best possible material". How can you e.g. use that material in a certain product even if it is not fulfilling the demands? Give an example. (See Handout)
2. **Bulk Micromachining.** Explain in a simple way the technique for Bulk Micromachining. (Ch 29.2)
3. **Metal-matrix Composites.** Describe how a Metal-matrix Composite is built up. (Ch 9.5)
4. **Electrochemical Machining.** Explain the principles for Electrochemical machining. (Ch 27.3)
5. **Material Structure.** Describe briefly how plastic deformation in a metal is performed related to the atom movement in the material. (Ch 1.3)

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

6. **Hybrid Machining systems.** Describe and motivate two different manufacturing processes for Hybrid machining in combination with
 - a) Abrasive Machining.
 - b) Water-jet cutting.(Ch 27)
7. **Thermal spraying.** Describe the two main processes for thermal spraying (i.e. Combustion spraying and Electrical spraying) and describe each of the two variants. (Ch 34.5)
8. **Laser machining.** Compare: a) laser cutting and b) laser welding, with some traditional manufacturing processes. (Ch 27.6 and 30)
9. **PM.** Explain with text and figures the principles for sintering Powder Metallurgy products regarding the quality of the produced product. The answer must describe porosity, surface oxides and mechanical strength. (Ch 17)
10. **Feature Based Machining (FBM).** Describe how FBM could save time and cost for manufacturing process planning.