

School of Engineering Science

WRITTEN EXAMINATION

Course: Alternative Manufacturing Methods

Sub-course: Written Examination

Course code: VP716A

Credits for written examination: 4 ECTS

Date: 2023-12-15

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 < 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. **Hybride processes.** Describe the meaning of a general hybrid process related to modern manufacturing. (Ch 27)
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. **Electrical-discharge Machining EDM).** Explain the principles for EDM. (Ch 27.5)
5. **Material Structure.** Describe briefly how plastic deformation in a metal is related to the crystal type. (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. **Materials Selection.** Why is material selection important in a manufacturing process? Describe the principles for a specific case.
(See Handout)
7. **Vapour Deposition.** Mention the two main processes for vapour (am. *vapor*) deposition and describe each of them. Also give some examples of products related to this technique (Ch 34.6)
8. **Laser machining.** Describe and draw a simple picture of the laser beam process. I.e. how the beam is created and directed to the workpiece.
(Ch 27.6 and 30)
9. **PM.** Explain with text and figures the principles for sintering Powder Metallurgy products regarding the microstructure. Also explain some typical faults (material problems) related to the sintering process. (Ch 17)
10. **Feature Based Machining (FBM).** Describe how FBM could save time and cost for manufacturing process planning.