UNIVERSITY
OF SKÖVDE

School of Engineering Science

WRITTEN EXAMINATION

Course: Alternative Manufacturing Methods

Sub-course: Written Examination

Course code: VP716A

Credits for written examination: 4 ECTS

Date: 2025-10-28

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!

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

1. **Alternative Manufacturing.** Give an example of a product which is almost impossible to produce without alternative modern manufacturing! Motivate your answer! (See Handouts)

2. **CFRP materials.** Explain at least two typical steps in order to manufacture Carbon Reinforced Plastics! (Ch 9.1-4)

3. **Metal-matrix Composites.** Describe how a Metal-matrix Composite is built up. (Ch 9.5)

4. **Electrochemical Machining.** Give an example of a product where EM is a suitable method (Ch 27.3)

5. **Material Structure.** Describe briefly how plastic deformation in a thermoplastic material is performed related to the atom movement in the material. (Ch 7)

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

6. **Powder Metallurgy**. Describe PM manufacturing for the two different technical products below and motivate the pros and cons for the two products compared to traditional manufacturing:
   a) Cogwheel.
   b) Porous filter.

   (Ch 17)

7. **Alternative Manufacturing.** Give an example of a common (technical) product. Describe and motivate the use of at least three different alternative production methods (advanced machining methods) in order to produce different parts of the product. (Handouts and Course book)

8. **Electron Beam Machining.** Draw a simple figure and explain the basic technique in production with the help of EBM. At least three main different areas must be described deeply about the technique.
   (Ch 27.7 and 30.6)

9. **Composites.** Explain some relevant properties and production steps for three types of fibers used I modern reinforced plastics. (Ch 9)

10. **Feature Based Machining (FBM).** Describe how machining feature is defined, and utilized to facilitate automatic CNC programming.