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: 2024-11-26

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 by a formative assessment based on the course objectives.

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! 1 p per task!

1. **Alternative Manufacturing.** Explain a typical "Alternative manufacturing method" and motivate why it is an alternative method compared with traditional Manufacturing. (I.e. focus on the differences in your answer!)

2. **PM.** Describe two typical drawbacks for products made by Powder Metallurgy.

3. **Nanoscale Manufacturing.** Give examples of two products where nanoscale manufacturing is of interest.

4. **Material properties.** Motivate why many metals (like Al, Cu and Ag) are easy to deform (i.e. they are ductile) compared with ceramic materials at room temperature.

5. **Material Structure.** Select a material type (like a metal or a polymer) and describe some changes in properties for the chosen material when it is in an amorphous atomic state versus a crystalline one. (I.e. what is the difference in material properties between an amorphous and a crystalline 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**. Chose a technical product. Look at a special part of it and make a material selection with 2 different materials, listed side by side. Chose at least 5 requirements for the product and try to estimate possible properties for the materials! Finally: Select and motivate one possible material based on your estimated selection.

7. **Loop System of CNC.** Describe two different types of loop systems used by CNC machine tools.

8. **Thermal Spraying/Coatings.** Describe 3 advantages of coating processes for metals.

9. **Waterjet Machining.** Explain with text and figures the principles for Waterjet Machining. The answer must describe possible water additions, surface quality and at least two disadvantages!

10. **Free form Fabrication.** Describe some possible trends and realistic possibilities for Free Form Fabrication in the future.