Final exam questions

Subject group name: **Advanced manufacturing**

Neptun code: ZVEGEGTNWAM

Credit points: 5

Subject in this subject group:

- **Advanced manufacturing** (BMEGEGTNWAM)

Program: Mechanical Engineering Modelling, MSc (2N-MW0)

Specialization: Design and Technology

Responsible person:

- Dr. Márton Takács, takacs.marton@gpk.bme.hu
  Department of Manufacturing Science and Engineering, Faculty of Mechanical Engineering

Dr. Márton Takács

associate professor

Advanced manufacturing (BMEGEGTNWAM)

1. Basics of material removal
    Comparison of subtractive and additive manufacturing processes. Hybrid machining. Cutting tool geometry. Kinematic angles. Cutting inserts. Tool materials. Cutting process parameters and their effects. Roughing and finishing. Chip formation. Chip types. Built-up edge.

2. Characteristics of chip removal processes
    Cutting methods. Cutting forces. Cutting temperature. Cutting fluids. Tool wear and tool life. Turning. Milling. Drilling. Machine tools.

3. Laser beam machining
    Characteristics of Laser beam. Lasing process. Laser types. Laser safety classes before and after 2002. Workability of materials by laser beam. Processes and methods (cutting, welding, drilling, marking, cleaning). Mechanism of machining by laser beam. Keyhole effect. Hybrid machining.

4. Fine surface finishing I.
    Machining with fixed abrasive grains (honing, flex-hone, superfinishing). Methods, kinematics, types of machined part geometries, typical constructions of tool and machine tool. Typical applications.

5. Fine surface finishing II.
    Machining with loose abrasive grains (lapping, polishing / buffing, sand polishing). Methods, kinematics, types of machined part geometries, typical constructions of tool and machine tool. Typical applications.

6. Electrical discharge machining
    Processes and methods (wire, sinking, milling). Machinability of different workpiece materials. Mechanism of material removal by electrical sparks. Electrode materials.

7. Electrochemical Machining
    Principles of material removal. Technology aspects.

8. High precision machining I.
    Difference between accuracy and precision. Application of diamond. Effect of elastic anisotropy. Machining with diamond tools.

9. High precision machining II.
    Effect of chip thickness. Deformation zones. Brittle and ductile mode cutting of materials. Grinding tools.

10. Hard cutting
    Fundamentals of hard cutting. Mechanism of chip removal. Cutting parameters (typical ranges of cutting speed, feed rate, depth of cut) and process parameters (cutting force components, cutting temperature). Cutting tools for hard cutting (geometry, materials).

11. Ultrasonic machining
    Ultrasonic wave generation (principles of magnetostriction and electrostriction), tuning of sonotrodes, effect of process parameters, applications.

12. Blow moulding processes I.
Extrusion and stretch blow moulding processes, solutions. Blow moulding tool design aspects. Mould manufacturing process alternatives.

13. Blow moulding processes II.
Main characters of the injection moulding process. Determination of the parting line (curve) and surface. Designing rules for 3-plates mould tools.

14. Water jet machining
Machine design. applications, process parameters.

15. Cleanroom technologies
Description. Classes of cleanrooms. Difference between laminar and turbulent flow.

16. Rapid prototyping
Product cycle life. The role of the Rapid prototyping, Rapid tooling and Direct manufacturing in the product life cycle. Rapid prototyping and Rapid tooling process steps and applications in the tool production.

17. Additive manufacturing
methods for metal and polymer printing. Comparison of the technologies.