



Orientation topics for final exam

The topics listed below may not be the same as the actual questions of the final exam. However, the topics comprise a guideline: they show a recommended systemisation of the subject's curriculum. Topics include the learning material of lectures, practises and laboratories (if there was any).

1. Basic characteristics of metal-cutting NC/CNC machine tools. Selection criteria of machine tools. Basic functioning of an NC machine tool. Advantages of CNC over conventional NC systems.
2. Units of CNC machine tools. Elements of CNC integration. Signing of NC motion axes (X, Y, Z, A, B, C).
3. Structural materials of machine tools. Trends in structural materials / structural design of machine tools.
4. Main building units of linear motion systems. Advantages and disadvantages of sliding (friction) guideways. Typical constructions of linear sliding guideways.
5. Advantages and disadvantages of rolling guideways. Types of rolling guideways. Characteristics of caged rolling guideways. Service life calculation and static load calculation of rolling guideways.
6. Principle and characteristics of hydrostatic guideways.
7. Main parts of a ball screw drive. Characteristics and types of ball screws. Preloading methods of ball screws. Mounting methods of ball screws.
8. Selection (calculations) of ball screws: (1) Service life (dynamic load); (2) Permissible rotational speed; (3) Permissible axial load (buckling load, static load). Definition of DN number of ball screws. Problems / limitations of using ball screws.
9. Rack and pinion drive: advantages, disadvantages, preloading methods, application for machine tools.
10. Types of linear motors. Advantages and disadvantages of linear motors and their application for machine tools.
11. Hydrostatic screws: construction principle, advantages, disadvantages and their application for machine tools.
12. NC rotary feed motion: driving mechanisms (gears; worm wheel; torque motor). Advantages and disadvantages of torque motors and their application.
13. Machine tool spindles I. Basic requirements of spindles. Types and characteristics (advantages, disadvantages) of spindles: belt, gear, direct, integrated (built-in) spindles.
14. Machine tool spindles II. Types of spindle bearings. Typical rolling bearings used for spindles. Characteristics of hybrid ceramic ball bearings and their application for machine tool spindles. Lubrication of rolling bearing spindles.
15. Machine tool spindles III. Characteristics of magnetic bearings, hydrostatic bearings and aerostatic bearings and their application for machine tool spindles.
16. Machine tool spindles IV. Construction types and main building units of lathe spindles and milling spindles.

In effect from:
2017/18
II. semester

NC Machine Tools
BMEGEGTMW03



17. Machining centres I. Definition, classification and typical constructions of machining centres. Building units of machining centres.
18. Machining centres II. Types of tool magazines, tool changers, pallet changers and pallet stores.
19. Machining centres III. Application of two ball screws for driving a slide. Types and main characteristics of 5-axis machining centres.
20. Building units of CNC lathes: spindle, slides, tailstock, turret, steady rest, workholding devices, workpiece feeding solutions.
21. Characteristics of CNC turning centres. Why a turning centre is more than a normal lathe? Typical construction of one or double spindle lathes and turning centres.
22. Multifunctional metal-cutting machine tools and hybrid machine tools: typical solutions.
23. Principle of parallel kinematics machine tools (PKMs). Advantages and disadvantages of PKMs compared to serial machine tools.

Updated at: 1. June 2018