



**Final Exam topics**

**MANUFACTURING EQUIPMENTS AND SYSTEMS**

1. Design and adjustment of universal lathes for various turning tasks (taper turning, contour turning, threading, etc.).
2. Environment of the flexible manufacturing cell, main and secondary activities in the manufacturing system, supervision basics, self-diagnosis, condition monitoring terms.
3. General structure and typical units of a manufacturing cell, tasks within the cell, structure and tasks of the cell control system, PLC location and his role in the cell.
4. Different types of lathes (construction, application areas).
5. General construction of CNC machine. (Main drives, positioning drives, guideways, etc.)
6. Construction and operation of the single-spindle turret lathe machine (function of camshaft and switch shaft, switching devices, turret changes, material positioning, etc.).
7. NC machine programming, steps, auxiliary tools, technological documentation, geometric data definition. (Coordinate systems, zero-point correction).
8. Most important design forms of drives used by numerically controlled machine tools, types, characteristics of main drives and positioning drives.
9. Digital motion sensors. The principle of absolute and incremental motion measuring, motion direction detection, reading and detection problems and solutions.
10. Structure and main features of drilling machines, (horizontal drilling machines, drilling-milling machines, coordinate drilling machines, fine drilling machines).
11. Most important types of encoder systems used on NC machines. Classification and characteristics of transducers.
12. Structure, main components and accessories of universal milling machines, use of a universal dividing (indexing) head for different tasks.
13. Technological basis of the adaptive control, features that can be provided by basic AC types.
14. Structure and main types of circular grinding machines (universal surface grinders, bore grinders, centreless grinders, cylinder-bore grinders).
15. Machine tools with real time adaptive control system, disturbance factors, adjusting and measured values. Basic types of AC and their characteristics. Levels of status monitoring, tasks and solutions for each level.



16. CNC machine tools. Basic structure of the CNC control system, features, elements, microprograms, services.
17. Gear manufacturing procedures-basic principles, structure and function of Pfauter type machine, (Block diagram, settings for different gear manufacturing tasks)
18. Gear manufacturing procedures-basic principles, structure and function of Fellow type machine, (Block diagram, settings for different gear manufacturing tasks)
19. Gear manufacturing procedures-basic principles, structure and function of Maag type machine, (Block diagram, settings for different gear manufacturing tasks)
20. Process Control Computer used for control of machine tools, differences between process control and data processing computers (in applications), basic computer architecture, process periphery, DNC.
21. Planer milling machines (with bed design) and special milling machines (pantograph, copier, coordinate milling machine, etc.).
22. Principle of numerical control, general structure of the control and tasks of each unit.
23. Structure, characteristics, main features and application of the synchronous motors used in machine tools.
24. Feed solutions for drilling machines, design of radial drilling machines (column, sleeve, wing, spindle housing, settings, etc.)
25. DC motors used in machine tools and production systems, basic principles, types, design, application.
26. Structure, properties, main characteristics and applications of the asynchronous motors used in machine tools.
27. Types, properties and applications of the special electric motors used in machine tools, BLDC, stepper, synchronous and asynchronous linear motors, torque motors.
28. Different types, structures, properties, and applications of stepper motors.