SYLABUS

Of Final State Exams for Study Program **Production Systems and Quality Management**

Production systems

Programming of Production and Manipulation technology

1. What does CNC mean? Write the main parts, what are the main differences between the traditional NC system and the modern CNC system?
2. What is CNC machining center and describe its components! Please, describe the principle of the movement PTP and CP movements?
3. What is the interpolation on the CNC machine tools? Explain the principle of linear interpolation. What are the loop systems for controlling tool movement? Describe advantages and disadvantages!
4. What is distance between absolute programming and incremental programming of CNC machines tools? Describe advantages and disadvantages. Which of CNC codes do you know? What is N, G, F, X, Z, S, and M in the CNC programming? Give the examples!
5. Describe the zero points on the CNC lathe? Where are they? Which are the important points on a CNC lathe? Please, draw the picture!
6. Write the homogeneous transforms for rotation about the z axis at angle θ and translation along the x axis a distance a! What is the Denavit - Hartenberg convention on the industrials robot?
7. Which coordinate systems on the robot KUKA do you know?

Production technologies I a II

8. Geometry of the tool in the static coordinate system, root chips, wear cutting wedge, built-up-edge when machining.
9. Mechanism of tool wear, tool durability, influence of selected parameters on cutting edge durability, life cycle of the tool.
10. Machining of metallic materials, cutting efficiency of tool materials.
11. Cutting forces in machining, cutting force calculation models, heat and machining temperature.
12. Optimization of cutting conditions, general optimization procedure, available solutions.
13. Satisfactory solutions for optimizing cutting conditions, permissible solutions.
14. Target functions for optimizing of cutting conditions, their determination.

Industrial Robots and Manipulators for Automotive Production

15. Industrial robots and manipulators (IRaM) as a part of production system, IRaM classification, IRaM application review in production and nonproduction areas.
16. Major technical characteristics of IRaM, measurement and evaluation of these characteristics.
17. Robot as mechatronic system – mechanical subsystem (major kinematic structures, shapes of a robot workspace), drive systems (pneumatic, hydraulic, electric and special drives units).
18. Robot programming methods – on-line and off-line methods, off-line programming systems
19. Output effectors of industrial robots – classification and characteristics of basic constructions solutions
20. Peripheral devices of robotic workstations

Computer Aided Production

21. Computer aided production, basic description of computer aided systems.
22. CAD systems, description, modules, 3D modeling concepts of components, benefits, features.
23. CAQ systems, methods and tools of quality management, FMEA analysis, coordinate measuring machines.
24. CAPP systems, technological preparation of production, its tasks, technological documentation, principles of creation of technological documentation.

Maintenance and Reliability in Automotive Production System

25. Maintenance as part of the manufacturing process, tasks and maintenance objectives, the types of maintenance.
26. Total Productive Maintenance (TPM) – basic principle, three zero program, autonomous maintenance.
27. Standardisation of maintenance works – types of standards used in industrial maintenance.
28. Evaluation of the effectiveness of maintenance, Overall Equipment Effectiveness (OEE), calculation of availability, performance and quality.
29. Types of failures, ways to wear of machine parts.
30. Preventive maintenance, fundamentals of vibration diagnostics, infrared thermography, oil analysis.

Design and operation of Manufacturing Systems

31. Subject and importance of engineering production design. The influence of seriality and repeatability of production on solving issues of technological design. P-Q diagram, ABC analysis.
32. Technological subsystem of production systems. Control elements, measurement and functional principle of CNC machine tool operation.
33. NC program. NC program structure, programming methods, functions, corrections
34. Handling subsystems. Application options, robot workspaces, types, selection procedure of robotic arms.
35. End effector. Distribution, choice, advantages and disadvantages of individual types. Sensors used in the automation process and their applications.
36. Drives used in the automation process. Types, advantages, disadvantages.
37. Transportation and storage subsystem. Requirements, handling places, Technical means of interoperational transport and storage.
38. Control and diagnostics subsystems. Measuring accuracy apparatus, manufacturing accuracy.
39. Designing assembly workplaces. Technical – organizational forms of the assembly process.
40. Disposition solution of engineering production. Placement methods for the layout design.

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Quality Management

Total Quality Management

1. Basic concepts of quality management (quality of product, quality management, process, process approach).
2. Evolution from quantity to quality.
3. Quality management system (8 principles of quality management, quality management process model).
4. Theory of Deming and Juran, characteristic signs.
5. International standardization of quality systems. Standards of quality.
6. Certification and accreditation.
7. Philosophy and principles of TQM.
8. Social and technical subsystem of TQM.
9. House of Quality (three pillars of TQM).
10. European model of TQM (Business Excellence model, EFQM).
11. Integrated management system.
12. Total quality management methods.
13. Quality audits.

Production Management

14. Production and operation management, production system – characteristics and tasks. Core and support functions of production system – their characteristics and relationships.
15. Production and manufacturing system, its classification and characteristics – production quantity.
16. Layout planning – types of layout and its characteristics.
17. Capacity Planning. Definition, measuring capacity and its importance to the organization. Steps in capacity planning.
18. Inventory management – types and uses of inventory, inventory performance measures.
19. Material Requirements Planning – characteristics, objectives, structure, Enterprise Resource Planning.
20. System JIT, its characteristics and benefits for production management.