

Sector: Manufacturing

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NATIONAL VOCATIONAL EDUCATION QUALIFICATION FRAMEWORK

SECTOR: MANUFACTURING

SPECIALIZATION: PRODUCT AND MANUFACTURING

S.No.	Certificate Level	Vocational Hours
1.	Level-I	200 hrs
2.	Level-II	250 hrs
3.	Level-III	350 hrs
4.	Level-IV	350 hrs
5.	Level-V	500 hrs
6.	Level-VI	550 hrs
7.	Level-VII	750 hrs

Certificate Level – I

1. TOOLS USAGE
2. DEMONSTRATION: LATHE (MAN 101)
3. SPECIFICATIONS: LATHE (MAN 101)

(MAN 101)

Practical Competencies	Underpinning Knowledge (Theory)
<ul style="list-style-type: none"> ➤ Select, use, clean and store personal safety protective equipment. ➤ Demonstrate the use of safety devices on metal cutting machines ➤ Demonstrate the use of work holding devices on metal cutting machines. ➤ Use and store of materials in a safe manner. ➤ Preparation of process planning sheet ➤ Check measurements of components/machined parts, using micrometers and verniers. ➤ Check roundness of components using the dial test indicator and vee blocks. ➤ Practice on faceplate balancing. ➤ Re-sharpen of plain turning tool on pedestal grinder and inspection ➤ Practical on work alignment, facing, turning, drilling, chamfering, and parting off. ➤ Carryout general turning between centers, such as stepped shafts using fixed and traveling steadies. ➤ Practical on Taper turning by compound slide method. ➤ Use sine bars and sine centers to set up and 	<ul style="list-style-type: none"> ➤ State the safety precaution specific to turning on the lathe. ➤ Explain the principles workshop layout ➤ State the purpose of turning. ➤ Describe the principle of the measuring instruments: its action, care and use for measurement setting up and assembly operations- Micrometer: internal, external, depth. vernier : Caliper, depth, height. ➤ Identify types of lathe tools and their uses. ➤ Describe the geometry of the lathe tool including tool angles and its effect on turning for roughing and finishing operation ➤ Type of cutting fluids & properties. ➤ Carry out Simple machining calculation. ➤ Calculation of speed, feed & depth of cut using chart. ➤ Describe the basic method of Work holding devices – three jaw chuck, four jaw chuck, face plate, collet chuck etc. ➤ Describe the basic methods of supporting work – fixed steady, traveling steady.

<p>check tapers.</p> <ul style="list-style-type: none">➤ Cut and chase screw threads.➤ Simple Form turning using manual feed.➤ Practical on Knurling.	
	<ul style="list-style-type: none">➤ Introduction to Lathe, description, types of Lathe – constructional features and functions.➤ Specification of a Center Lathe.➤ Lathe operations- turn, drill, face, chamfer, and part off knurl, threading, taper and form turn.➤ Describe the different types of drills and taps used.➤ Classification of steels, alloy steels and effect of alloying elements.➤ Identify the turning fault & remedies.

Certificate Level – II

1. TOOLS USAGE
2. DEMONSTRATION: MILLING (MAN 103)
3. SPECIFICATIONS: MILLING (MAN 103)

(MAN 103)

Practical Competencies	Underpinning Knowledge (Theory)
<ul style="list-style-type: none"> ➤ Select, use, clean and store personal safety protective equipment. ➤ Demonstrate the use of safety devices on metal cutting machines ➤ Demonstrate the use of work holding devices on metal cutting machines. ➤ Use and store of materials in a safe manner. ➤ Preparation of process planning sheet ➤ Check measurements of components/machined parts, using micrometers and verniers. ➤ Check roundness of components using the dial test indicator and vee blocks. ➤ Demo on ➤ Identifying different types of cutter used in Horizontal milling machine. ➤ Identifying different types of cutter used in Vertical milling machine. ➤ Study of Horizontal milling machine - Identifying different parts, importance of each part. ➤ Study of Vertical milling machine - Identifying different parts, importance of each part ➤ Use of Tool holding devices. ➤ Practice on dividing head. ➤ Practical on plain milling, slab milling. 	<ul style="list-style-type: none"> ➤ State the safety precaution specific to milling operations. ➤ Explain the principles workshop layout, blue print reading. ➤ Describe the principle of the measuring instruments: its action, care and use for measurement setting up and assembly operations- Micrometer: internal, external, depth. vernier : Caliper, depth, height. ➤ State the purpose of Milling. ➤ Classification & properties of tool materials & selection criteria . ISO specification on carbide tools. ➤ Basic knowledge of different tool materials (including their temperature ranges) in use. ➤ Milling machine – Types, constructional features, Specifications - Merits and demerits ➤ Describe Work holding methods and work holding devices for milling operations. ➤ Type of dividing head and indexing method ➤ Nomenclature of milling cutters. ➤ Classification of different types of milling cutters and their uses. ➤ Processes of milling – up milling, down milling, face milling and end milling. ➤ Describe horizontal milling operations- milling

<ul style="list-style-type: none"> ➤ Checking the flatness with tri-square. ➤ Milling six faces of a cubical block to an accuracy of \pm 0.1mm. ➤ Checking the square ness with tri-square. ➤ Measure the job size with vernier caliper. ➤ Step milling using side and face milling cutter. ➤ Angular milling using angular milling cutter and checking with bevel protractor. ➤ Slot milling using slot milling cutter / slitting saw. 	<p>of flat surfaces, Gang and straddle milling, production of narrow slots, slotting and slitting of thin plates, key way cutting etc.</p> <ul style="list-style-type: none"> ➤ Describe vertical milling operations- milling of sunk and recessed surfaces, woodruff cutters, use of shell end mills, face mills, face slot cutters, dovetail cutters etc. ➤ Cutting fluid, properties & applications. ➤ Selection of speed feed and depth of cut. ➤ Identify Milling fault & correction.
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Certificate Level – III

1. TOOLS USAGE
2. Computer Basics (MAN307)
1. COMPONENTS AND SOFTWARE (MAN307)

(MAN 307)

Practical Competencies	Underpinning Knowledge (Theory)
<ul style="list-style-type: none"> ➤ Demo on ➤ Personal and Industrial Safety. ➤ Select, use, clean and store personal protective equipment. ➤ Study of CNC machine, key board & specifications. Demonstrate Machine starting & operating in Reference Point, JOG, and Incremental Modes ➤ Carryout Co-ordinate system points, assignments and simulations. ➤ Carryout Absolute and incremental programming assignments and simulations. ➤ Demonstration of machine over travel limits and emergency stop. ➤ Demonstrate Work and tool setting. ➤ Carryout Part program preparation, Simulation & Automatic Mode Execution for the exercise on Simple turning & Facing (step turning) ➤ Carryout Linear interpolation, and Circular interpolation assignments and simulations on soft ware. ➤ Carryout Work off set measurement, Tool off set measurement and entry in CNC Control. ➤ Carryout Part program preparation, Simulation & Automatic Mode Execution for the exercise on Turning with Radius / chamfer with TNRC ➤ Demonstrate Chuck removal and mounting on CNC Lathe. Demonstrate Tool change in CNC turning & MPG mode operation. ➤ Carryout Manual Data Input (MDI) mode operations and checking of zero offsets and tool offsets. ➤ Carryout Part program preparation, Simulation & Automatic Mode Execution of CNC Machine for the exercise on Blue print programming contours with TNRC. ➤ Carryout Geometry Wear Correction. ➤ Carryout Geometry and wear offset correction. Carryout Part program preparation, Simulation & Automatic Mode Execution of CNC Machine for the Practical on stock removal cycle OD 	<ul style="list-style-type: none"> ➤ Safety Precautions ➤ State the Safe handling of tools, equipment & CNC machines, Conventional & CNC machining. ➤ State the types of CNC machines, advantages & limitations of CNC, computer numerical control applications, Future of computer numerical control technology. ➤ Describe CNC interpolation, open loop & close loop control systems. Co-ordinate systems and Points. ➤ State the CNC Machines – Turning - Milling, - Types, Machine axes. ➤ Identify the CNC Machine Control Unit organization.(Keys & Menus) ➤ Explain working principle of CNC Machine Carryout Zero off sets and tool off sets in SIEMENS /FANUC CNC TURNING. Centers State the importance of feedback devices for CNC control. ➤ State the importance of tTool Nose Radius Compensation (TNRC). ➤ Identify Cutting tool materials for CNC Turning and its applications. Component Materials. Identify ISO codes for carbide indexable inserts and tool holders for turning. ➤ Describe the tooling systems for CNC TURNING Centers. ➤ State the cutting parameters selection and process planning. ➤ Tools layout and process sheet preparation. ➤ Using Sub Programs & Cycles in the Main Program. Blue print programming/ Direct dimension programming. ➤ Part Features identification and process selection. ➤ Processes sequencing. Tool path planning. ➤ Carryout Work-piece zero points and ISO/DIN G and M codes for CNC. ➤ Describe the stock removal cycle in CNC

<ul style="list-style-type: none"> ➤ Practical on Drilling / boring cycles ➤ Practical on Stock removal cycle ID ➤ Preparations of part programs for thread cutting for CNC ➤ turning centers and simulation on computers. ➤ Carryout Machining of Part program exercises of CNC TURNING <ul style="list-style-type: none"> ➤ Practical on Grooving and thread cutting OD ➤ Practical on Grooving and thread cutting ID ➤ Practical on Threading cycle OD ➤ Practical on Sub programs with repetition 	<ul style="list-style-type: none"> ➤ turning for OD / ID operation. ➤ Describe Tooling system for turning and tooling strategies for CNC turning machines. ➤ Carryout Drilling /Boring cycles in CNC Turning Grooving/Threading Tools, Processes and Tool selection. ➤ Programming for Grooving/Threading on OD/ID in CNC Turning. ➤ Trouble shooting in CNC Turning. Tool wear Patterns and optimization of cutting parameters. Identify Factors affecting Turned part quality/ productivity. ➤ Describe Tapping / rigid tapping on CNC turning.
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Certificate Level – IV

1. TOOLS USAGE
2. NC MACHINES(MAN 307)
3. CNC MACHINES(MAN 307)

(MAN 307)

Practical Competencies	Underpinning Knowledge (Theory)
<ul style="list-style-type: none"> ➤ Demo on ➤ Personal and Industrial Safety. ➤ Select, use, clean and store personal protective equipment. ➤ Study of CNC machine, key board & specifications. Demonstrate Machine starting & operating in Reference Point, JOG, and Incremental Modes ➤ Carryout Co-ordinate system points, assignments and simulations. ➤ Carryout Absolute and incremental programming assignments and simulations. ➤ Demonstration of machine over travel limits and emergency stop. ➤ Demonstrate Work and tool setting. ➤ Carryout Part program preparation, Simulation & Automatic Mode Execution for the exercise on Simple turning & Facing (step turning) ➤ Carryout Linear interpolation, and Circular interpolation assignments and simulations on soft ware. ➤ Carryout Work off set measurement, Tool off set measurement and entry in CNC Control. ➤ Carryout Part program preparation, Simulation & Automatic Mode Execution for the exercise on Turning with Radius / chamfer with TNRC ➤ Demonstrate Chuck removal and mounting on CNC Lathe. Demonstrate Tool change in CNC turning & MPG mode operation. ➤ Carryout Manual Data Input (MDI) mode operations and checking of zero offsets and tool offsets. ➤ Carryout Part program preparation, Simulation & Automatic Mode Execution of CNC Machine for the exercise on Blue print programming contours with TNRC. 	<ul style="list-style-type: none"> ➤ Safety Precautions ➤ State the Safe handling of tools, equipment & CNC machines, Conventional & CNC machining. ➤ State the types of CNC machines, advantages & limitations of CNC, computer numerical control applications, Future of computer numerical control technology. ➤ Describe CNC interpolation, open loop & close loop control systems. Co-ordinate systems and Points. ➤ State the CNC Machines – Turning - Milling, - Types, Machine axes. ➤ Identify the CNC Machine Control Unit organization.(Keys & Menus) ➤ Explain working principle of CNC Machine Carryout Zero off sets and tool off sets in SIEMENS /FANUC CNC TURNING. Centers State the importance of feedback devices for CNC control. ➤ State the importance of tTool Nose Radius Compensation (TNRC). ➤ Identify Cutting tool materials for CNC Turning and its applications. Component Materials. Identify ISO codes for carbide indexable inserts and tool holders for turning. ➤ Describe the tooling systems for CNC TURNING Centers. ➤ State the cutting parameters selection and process planning. ➤ Tools layout and process sheet preparation. ➤ Using Sub Programs & Cycles in the Main Program. Blue print programming/ Direct dimension programming. ➤ Part Features identification and process selection. ➤ Processes sequencing. Tool

<ul style="list-style-type: none"> ➤ Carryout Geometry Wear Correction. ➤ Carryout Geometry and wear offset correction. Carryout Part program preparation, Simulation & Automatic Mode Execution of CNC Machine for the Practical on stock removal cycle OD ➤ Practical on Drilling / boring cycles ➤ Practical on Stock removal cycle ID ➤ Preparations of part programs for thread cutting for CNC ➤ turning centers and simulation on computers. ➤ Carryout Machining of Part program exercises of CNC TURNING ➤ <ul style="list-style-type: none"> ▪ Practical on Grooving and thread cutting OD ▪ Practical on Grooving and thread cutting ID ▪ Practical on Threading cycle OD ▪ Practical on Sub programs with repetition 	<ul style="list-style-type: none"> • path planning. ➤ Carryout Work-piece zero points and • ISO/DIN G ➤ and M codes for • CNC. ➤ Describe the stock removal cycle in CNC ➤ turning for OD / ID operation. ➤ Describe Tooling system for turning and tooling strategies for CNC turning machines. ➤ Carryout Drilling /Boring cycles in CNC Turning Grooving/Threading Tools, Processes and Tool selection. ➤ Programming for Grooving/Threading on OD/ID ➤ in CNC Turning. ➤ Trouble shooting in CNC Turning. Tool wear Patterns and optimization of cutting parameters. Identify Factors affecting Turned part quality/ productivity. ➤ Describe Tapping / rigid tapping on CNC ➤ turning.
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Certificate Level – V

1. TOOLS USAGE
2. INPUT DATA:NC AND CNC (MAN 307)

(MAN 307)

Practical Competencies	Underpinning Knowledge (Theory)
<ul style="list-style-type: none"> ➤ Demo on ➤ Personal and Industrial Safety. ➤ Select, use, clean and store personal protective equipment. ➤ Study of CNC machine, key board & specifications. Demonstrate Machine starting & operating in Reference Point, JOG, and Incremental Modes ➤ Carryout Co-ordinate system points, assignments and simulations. ➤ Carryout Absolute and incremental programming assignments and simulations. ➤ Demonstration of machine over travel limits and emergency stop. ➤ Demonstrate Work and tool setting. ➤ Carryout Part program preparation, Simulation & Automatic Mode Execution for the exercise on Simple turning & Facing (step turning) ➤ Carryout Linear interpolation, and Circular interpolation assignments and simulations on soft ware. ➤ Carryout Work off set measurement, Tool off set measurement and entry in CNC Control. ➤ Carryout Part program preparation, Simulation & Automatic Mode Execution for the exercise on Turning with Radius / chamfer with TNRC ➤ Demonstrate Chuck removal and mounting on CNC Lathe. Demonstrate Tool change in CNC turning & MPG mode operation. ➤ Carryout Manual Data Input (MDI) mode operations and checking of zero offsets and tool offsets. ➤ Carryout Part program preparation, Simulation & Automatic Mode Execution of CNC Machine for the exercise on Blue print programming contours with TNRC. ➤ Carryout Geometry Wear Correction. 	<ul style="list-style-type: none"> ➤ Safety Precautions ➤ State the Safe handling of tools, equipment & CNC machines, Conventional & CNC machining. ➤ State the types of CNC machines, advantages & limitations of CNC, computer numerical control applications, Future of computer numerical control technology. ➤ Describe CNC interpolation, open loop & close loop control systems. Co-ordinate systems and Points. ➤ State the CNC Machines – Turning - Milling, - Types, Machine axes. ➤ Identify the CNC Machine Control Unit organization.(Keys & Menus) ➤ Explain working principle of CNC Machine Carryout Zero off sets and tool off sets in SIEMENS /FANUC CNC TURNING. Centers State the importance of feedback devices for CNC control. ➤ State the importance of tTool Nose Radius Compensation (TNRC). ➤ Identify Cutting tool materials for CNC Turning and its applications. Component Materials. Identify ISO codes for carbide indexable inserts and tool holders for turning. ➤ Describe the tooling systems for CNC TURNING Centers. ➤ State the cutting parameters selection and process planning. ➤ Tools layout and process sheet preparation. ➤ Using Sub Programs & Cycles in the Main Program. Blue print programming/ Direct dimension programming. ➤ Part Features identification and process selection. ➤ Processes sequencing. Tool path planning.

<ul style="list-style-type: none"> ➤ Carryout Geometry and wear offset correction. Carryout Part program preparation, Simulation & Automatic Mode Execution of CNC Machine for the Practical on stock removal cycle OD ➤ Practical on Drilling / boring cycles ➤ Practical on Stock removal cycle ID ➤ Preparations of part programs for thread cutting for CNC ➤ turning centers and simulation on computers. ➤ Carryout Machining of Part program exercises of CNC TURNING ➤ <ul style="list-style-type: none"> ▪ Practical on Grooving and thread cutting OD ▪ Practical on Grooving and thread cutting ID ▪ Practical on Threading cycle OD ▪ Practical on Sub programs with repetition 	<ul style="list-style-type: none"> ➤ Carryout Work-piece zero points and <ul style="list-style-type: none"> • ISO/DIN G • and M codes for • CNC. ➤ Describe the stock removal cycle in CNC <ul style="list-style-type: none"> ➤ turning for OD / ID operation. ➤ Describe Tooling system for turning and tooling strategies for CNC turning machines. ➤ Carryout Drilling /Boring cycles in CNC Turning Grooving/Threading Tools, Processes and Tool selection. ➤ Programming for Grooving/Threading on OD/ID ➤ in CNC Turning. ➤ Trouble shooting in CNC Turning. Tool wear Patterns and optimization of cutting parameters. Identify Factors affecting Turned part quality/ productivity. ➤ Describe Tapping / rigid tapping on CNC turning.
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Certificate Level – VI

1. TOOLS USAGE
2. 'G' CODE 'M' CODE(MAN 307)
3. SUB PROGRAMMING (MAN 307)

(MAN 307)

Practical Competencies	Underpinning Knowledge (Theory)
<ul style="list-style-type: none"> ➤ Demo on ➤ Personal and Industrial Safety. ➤ Select, use, clean and store personal protective equipment. ➤ Study of CNC machine, key board & specifications. Demonstrate Machine starting & operating in Reference Point, JOG, and Incremental Modes ➤ Carryout Co-ordinate system points, assignments and simulations. ➤ Carryout Absolute and incremental programming assignments and simulations. ➤ Demonstration of machine over travel limits and emergency stop. ➤ Demonstrate Work and tool setting. ➤ Carryout Part program preparation, Simulation & Automatic Mode Execution for the exercise on Simple turning & Facing (step turning) ➤ Carryout Linear interpolation, and Circular interpolation assignments and simulations on soft ware. ➤ Carryout Work off set measurement, Tool off set measurement and entry in CNC Control. ➤ Carryout Part program preparation, Simulation & Automatic Mode Execution for the exercise on Turning with Radius / chamfer with TNRC ➤ Demonstrate Chuck removal and mounting on CNC Lathe. Demonstrate Tool change in CNC turning & MPG mode operation. ➤ Carryout Manual Data Input (MDI) mode operations and checking of zero offsets and tool offsets. ➤ Carryout Part program preparation, Simulation & Automatic Mode Execution of CNC Machine for the exercise on Blue print 	<ul style="list-style-type: none"> ➤ Safety Precautions ➤ State the Safe handling of tools, equipment & CNC machines, Conventional & CNC machining. ➤ State the types of CNC machines, advantages & limitations of CNC, computer numerical control applications, Future of computer numerical control technology. ➤ Describe CNC interpolation, open loop & close loop control systems. Co-ordinate systems and Points. ➤ State the CNC Machines – Turning - Milling, - Types, Machine axes. ➤ Identify the CNC Machine Control Unit organization.(Keys & Menus) ➤ Explain working principle of CNC Machine Carryout Zero off sets and tool off sets in SIEMENS /FANUC CNC TURNING. Centers State the importance of feedback devices for CNC control. ➤ State the importance of tTool Nose Radius Compensation (TNRC). ➤ Identify Cutting tool materials for CNC Turning and its applications. Component Materials. Identify ISO codes for carbide indexable inserts and tool holders for turning. ➤ Describe the tooling systems for CNC TURNING Centers. ➤ State the cutting parameters selection and process planning. ➤ Tools layout and process sheet preparation. ➤ Using Sub Programs & Cycles in the Main Program. Blue print programming/ Direct dimension programming. ➤ Part Features identification and process selection. ➤ Processes

<ul style="list-style-type: none"> ➤ programming contours with TNRC. ➤ Carryout Geometry Wear Correction. ➤ Carryout Geometry and wear offset correction. Carryout Part program preparation, Simulation & Automatic Mode Execution of CNC Machine for the Practical on stock removal cycle OD ➤ Practical on Drilling / boring cycles ➤ Practical on Stock removal cycle ID ➤ Preparations of part programs for thread cutting for CNC ➤ turning centers and simulation on computers. ➤ Carryout Machining of Part program exercises of CNC TURNING ➤ <ul style="list-style-type: none"> ▪ Practical on Grooving and thread cutting OD ▪ Practical on Grooving and thread cutting ID ▪ Practical on Threading cycle OD ▪ Practical on Sub programs with repetition 	<ul style="list-style-type: none"> • sequencing. Tool • path planning. ➤ Carryout Work-piece zero points and • ISO/DIN G ➤ and M codes for CNC. ➤ Describe the stock removal cycle in CNC ➤ turning for OD / ID operation. ➤ Describe Tooling system for turning and tooling strategies for CNC turning machines. ➤ Carryout Drilling /Boring cycles in CNC Turning Grooving/Threading Tools, Processes and Tool selection. ➤ Programming for Grooving/Threading on OD/ID ➤ in CNC Turning. ➤ Trouble shooting in CNC Turning. Tool wear Patterns and optimization of cutting parameters. Identify Factors affecting Turned part quality/ productivity. ➤ Describe Tapping / rigid tapping on CNC ➤ turning.
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Certificate Level – VII

1. TOOLS USAGE
2. FANUC CONTROLLER(MAN 307)
3. MACHINE START UP(MAN 307)
4. CONTROLS (MAN 307)

(MAN 307)

Practical Competencies	Underpinning Knowledge (Theory)
<ul style="list-style-type: none"> ➤ Demo on ➤ Personal and Industrial Safety. ➤ Select, use, clean and store personal protective equipment. ➤ Study of CNC machine, key board & specifications. Demonstrate Machine starting & operating in Reference Point, JOG, and Incremental Modes ➤ Carryout Co-ordinate system points, assignments and simulations. ➤ Carryout Absolute and incremental programming assignments and simulations. ➤ Demonstration of machine over travel limits and emergency stop. ➤ Demonstrate Work and tool setting. ➤ Carryout Part program preparation, Simulation & Automatic Mode Execution for the exercise on Simple turning & Facing (step turning) ➤ Carryout Linear interpolation, and Circular interpolation assignments and simulations on soft ware. ➤ Carryout Work off set measurement, Tool off set measurement and entry in CNC Control. ➤ Carryout Part program preparation, Simulation & Automatic Mode Execution for the exercise on Turning with Radius / chamfer with TNRC ➤ Demonstrate Chuck removal and mounting on CNC Lathe. Demonstrate Tool change in CNC turning & MPG mode operation. ➤ Carryout Manual Data Input (MDI) mode operations and checking of zero offsets and tool offsets. ➤ Carryout Part program preparation, Simulation & Automatic Mode Execution of 	<ul style="list-style-type: none"> ➤ Safety Precautions ➤ State the Safe handling of tools, equipment & CNC machines, Conventional & CNC machining. ➤ State the types of CNC machines, advantages & limitations of CNC, computer numerical control applications, Future of computer numerical control technology. ➤ Describe CNC interpolation, open loop & close loop control systems. Co-ordinate systems and Points. ➤ State the CNC Machines – Turning - Milling, - Types, Machine axes. ➤ Identify the CNC Machine Control Unit organization.(Keys & Menus) ➤ Explain working principle of CNC Machine Carryout Zero off sets and tool off sets in SIEMENS /FANUC CNC TURNING. Centers State the importance of feedback devices for CNC control. ➤ State the importance of tTool Nose Radius Compensation (TNRC). ➤ Identify Cutting tool materials for CNC Turning and its applications. Component Materials. Identify ISO codes for carbide indexable inserts and tool holders for turning. ➤ Describe the tooling systems for CNC TURNING Centers. ➤ State the cutting parameters selection and process planning. ➤ Tools layout and process sheet preparation. ➤ Using Sub Programs & Cycles in the Main Program. Blue print programming/ Direct dimension programming. ➤ Part Features identification and process selection.

<p>CNC Machine for the exercise on Blue print programming contours with TNRC.</p> <ul style="list-style-type: none"> ➤ Carryout Geometry Wear Correction. ➤ Carryout Geometry and wear offset correction. Carryout Part program preparation, Simulation & Automatic Mode Execution of CNC Machine for the Practical on stock removal cycle OD ➤ Practical on Drilling / boring cycles ➤ Practical on Stock removal cycle ID ➤ Preparations of part programs for thread cutting for CNC ➤ turning centers and simulation on computers. ➤ Carryout Machining of Part program exercises of CNC TURNING <ul style="list-style-type: none"> ➤ ▪ Practical on Grooving and thread cutting OD ➤ ▪ Practical on Grooving and thread cutting ID ➤ ▪ Practical on Threading cycle OD ➤ ▪ Practical on Sub programs with repetition 	<ul style="list-style-type: none"> ➤ Processes <ul style="list-style-type: none"> • sequencing. Tool • path planning. ➤ Carryout Work-piece zero points and ISO/DIN G <ul style="list-style-type: none"> • and M codes for CNC. ➤ Describe the stock removal cycle in CNC ➤ turning for OD / ID operation. ➤ Describe Tooling system for turning and tooling strategies for CNC turning machines. ➤ Carryout Drilling /Boring cycles in CNC Turning Grooving/Threading Tools, Processes and Tool selection. ➤ Programming for Grooving/Threading on OD/ID ➤ in CNC Turning. ➤ Trouble shooting in CNC Turning. Tool wear Patterns and optimization of cutting parameters. Identify Factors affecting Turned part quality/ productivity. ➤ Describe Tapping / rigid tapping on CNC ➤ turning.
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