

Preface to NSQF (Level-4) Compliant Edition

Directorate General of Training (DGT) under the Ministry of Skill Development and Entrepreneurship (MSDE) is the apex body in the country as regards planning, formulating and prescribing norms, standards, procedures and guidelines in respect of various vocational training schemes like craftsmen training scheme(CTS), apprenticeship training scheme(ATS), craft instructors' training scheme (CITS) and several other similar schemes, the core objective of which is to equip young people with skills as would help them secure decent employment. Of all these schemes CTS implemented through a vast network of Industrial Training Institutes, is by far the biggest in terms of not only the number of trainees deriving benefit, but also in terms of well-established and fully-equipped institutional framework.

Prescribing well designed curriculum and putting in place appropriate assessment and certification procedure are among the vital aspects of vocational training. DGT has not only designed and prescribed curriculum for each designated trade but also, in the recent past, brought into force the National Skill Qualification Framework (NSQF). The course structure for **TURNER TRADE**, having two years' training duration, has been designed in a way as would match the learning outcome to **Level 4**, under the sector of Capital Goods and Manufacturing.

This book has been developed in relation to the professional knowledge (trade theory) part of the prescribed curriculum for **TURNER TRADE**. The unique features of this book are:

- Theory subject matter presented in **Self-contained Modules format** – total 16 modules (9 for first year and 7 for second year)
- Each module supplemented with wide bank of multiple-choice questions, not only with key but also with essential explanatory notes to facilitate learning.
- Subject matter arranged **sequentially according to syllabus**, in simple easy-to-understand language and profusely illustrated.
- A set of 16 model papers (8 each for first and second year) on All India Annual Trade Test Pattern. Here again with key and essential explanatory notes.

We do firmly believe and hope that this **3-in-1 volume** viz.,

1. **Trade Theory**
2. **Assignment (MCQs)**
3. **Model Papers (Solved) for Annual A.I.T.T. Exam**

will be of great help to trainees to learn and understand theory subject of Turner trade and also equip them to confidently face All Indian Trade Test. We would, undoubtedly, welcome suggestions from our esteem readers that would help us make further improvements in subsequent editions.

— Author

Contents

NSQF (Level-4) compliant competency based curriculum for Turner under CTS (Latest Syllabus)..... vii – ix

1st Year

1. Workshop Safety	3–19
Introduction to the Trade: Job Role of a Turner, Career Progression Pathways, Maintaining Discipline in ITI, Soft Skills: Introduction, How to Greet People?, How to Introduce Yourself?, How to Answer Questions?, How to Handle Nervousness?, Making You Achieve Success, General Workshop Safety Precautions: First Aid: General, ABC of First Aid, Electrical Safety, Ppe, Response To Emergencies: Electrical Safety, Personal Protective Equipment, Response to Emergency, Fire Safety, House Keeping And Good Shop Floor Practices: Housekeeping, 5 S, Waste Disposal, Colour Coding of Bins for Waste Segregation, Occupational Safety and Health: Environmental Issues, Hot Work, Confined Space, Material Handling Equipment, Safety Signs, Hazards, Lifting Load	
Assignment/Test—Solved	15–19
• Multiple Choice Questions • Key to Multiple Choice Questions • Explanatory Notes	
2. Basics of Fitting	20–84
Linear Measurement: Units, Steel Rule, Scriber, Dividers, Datum, Calipers, Trammel, Prick Punch, Centre Punch, Hammers, Bench Vice, Screw Driver, 'Vee' Blocks, Testing Accuracy of 'V' Blocks, Precautions, Marking off and Marking off Table, Vice and Hacksaw: Vices, Care and Maintenance of Vices, Vice Clamps, Hacksaw, Hacksawing, Precautions, Try Square, Files: Types of Cuts, Grades, Filing, Filing Techniques, File Handle, Measuring Standards (English and Metric): System of Units, International System of Units (SI), Conversion of Metric and British, System of Units, Angular Measurements; Marking Media and Marking: Marking Media, Methods of Marking, Surface Gauge, Cold Chisels: Chisel, Chipping Operation, Grinding of Chisel, Method of Chipping, Surface Plate and Auxiliary Marking Equipment: Surface Plate, Angle Plates, Parallel Blocks, Physical and Mechanical Properties of Engineering Metals: Physical Properties, Mechanical Properties, Saws: Circular Saw, Reciprocating Saw, Band Saw, Micrometer: Outside Micrometer, Inside Micrometer, Vernier Calipers: Digital Height Gauge, Vernier Depth Gauge, Vernier Bevel Protractor, Drilling Processes: Drilling, Drilling Machines, Types of Drilling Machines, Drill Holding Devices, Work Holding, Devices, Cutting Speed and Feed, Sharpening of Twist Drills, Hand Taps: Tap Wrench, Threading Dies, Die Stock	
Assignment/Test—Solved	74–84
• Multiple Choice Questions • Key to Multiple Choice Questions • Explanatory Notes	
3. Lathe Construction and Operations	85–127
Lathe and Its Accessories: Lathe, Types of Lathes, Lathe Accessories, Safety Precautions While Working on Lathe; Lathe Specifications and Constructional Features: Lathe Specifications, Parts of Lathe, Feeding and Thread Cutting Mechanism, Holding Job between Centres, Lathe Cutting Tools: Different Shapes of Lathe Cutting, Tools, Different Lathe Tool Angles, Chaser, Classification of Tool Material, Tool Grinding, Cutting Speed and Feed, Coolants and Lubricants: Coolants (Cutting Fluid), Criteria for Selection, Lubrication, Lubricants, Chuck and Faceplate: Lathe Chuck, Mounting and Dismounting of Lathe Chucks, Face Plate, Holding Drill in Tailstock, Boring and Boring Tools, Turning Operations: Tool Setting, Parallel Turning, Stepped Turning, Shoulder Turning, Chamfering, Grooving, Filing, Polishing, Tool Post, Knurling,	
Assignment/Test—Solved	114–127
• Multiple Choice Questions • Key to Multiple Choice Questions • Explanatory Notes	
4. Taper Turning	128–137
Taper, Morse Taper, Brown and Sharpe Taper, Jacobs Taper, Jarno Taper, Taper Turning, Categories of Taper Turning, Checking Taper, Form Tools	
Assignment/Test—Solved	134–137
• Multiple Choice Questions • Key to Multiple Choice Questions • Explanatory Notes	
5. Lathe Accessories	138–152
Lathe Chuck, Mounting and Dismounting of Lathe, Chucks, Tool Post, Lathe Centres, Steady Rest, Lathe Carrier, Drive Plates, Face Plate, Lathe Mandrel, Toolmaker's Button	
Assignment/Test—Solved	146–152
• Multiple Choice Questions • Key to Multiple Choice Questions • Explanatory Notes	

6. Screw Threads and Thread Cutting..... 153–174	Assignment/Test—Solved..... 197–204
<i>Fastening, Screw; Screw Threads: Screw Thread Terminology, Screw Thread Profiles, Taps: Tapping, Hand Taps, Machine Taps, Pipe Threads and Pipe Taps, Tap Wrench, Thread Cutting, Methods of Catching the Thread, Hand Chasing, Thread Milling, Thread Grinding, Thread Casting</i>	• Multiple Choice Questions
Assignment/Test—Solved..... 167–174	• Key to Multiple Choice Questions
• Multiple Choice Questions	• Explanatory Notes
7. Soldering, Welding, Brazing..... 175–204	8. Grinding 205–213
Solder and Soldering: Soldering, Soldering Iron, Types of Solders, Soldering Flux, How to Solder, Silver Soldering, Welding; Gas Welding: Types of Flames, Types of Gas Welding, Gas Welding Equipment, Gas Cylinders, Regulators, Welding Blowpipe, Arc Welding: The Electric Arc, Manual Metal-Arc Welding, Welding Circuit, Striking the Arc, Arc Length, Arc Welding Equipment: A.C. Transformer, D.C. Welding Generator, Rectifier, Inverter, Machine Rating, Polarity, AC Versus DC, Arc Welding Voltage, Arc Welding Current, Welder's Accessories, Welded Joints: Types of Welded Joints, Edge Preparation Before Welding, Welding Positions, Brazing: Heating Methods	Grinding: Grinding, Types of Abrasives, Types of Bonds, Abrasive Grain Size, Grinding Wheel Grade, Grinding Wheel Structure, Grinding Wheel Shapes and Faces, Mounting of Grinding Wheel, Glazing and Loading, Wheel Balancing, Dressing and Truing, Grinding Wheel Selection, Off-Hand Grinding on Bench and Pedestal Grinders, Use of Coolant
	Assignment/Test—Solved..... 212–213
	• Multiple Choice Questions
	• Key to Multiple Choice Questions
	• Explanatory Notes
	9. Limits, Fits and Tolerances 214–225
	<i>Limits, Fits and Tolerances, Mass Production, Interchangeability, Selective Assembly, Basic Terminology for Limits and Fits, Types of Fits, Allowance, Symbols, Some Important Examples, Tolerance</i>
	Assignment/Test—Solved..... 221–225
	• Multiple Choice Questions
	• Key to Multiple Choice Questions
	• Explanatory Notes

Appendix : 1st Year Model Papers 1 to 8 (Annual A.I.T.T. Exam – NSQF Level – 4) ... 226–261

2nd Year

1. Cutting Tool Materials..... 3–12	<i>Fundamental Principles of Jigs and Fixtures Design, Fixture, Locating and Supporting in Jigs and Fixtures, Construction of Jigs and Fixtures, Fitting of Bushings, Materials for Jigs and Fixtures, Lathe Fixtures</i>
<i>Cutting Tool Materials, Tipped Tools, Stable and Unstable Materials, Selection of Tools, Factors Affecting the Life of a Cutting, Tool, Tool Geometry, Cutting Speed, Feed and Depth of Cut, For Shaping, Cutting Time, Cutting Speed, Feed and Depth of Cut, For Slotting</i>	Assignment/Test—Solved..... 30–35
Assignment/Test—Solved..... 9–12	• Multiple Choice Questions
• Multiple Choice Questions	• Key to Multiple Choice Questions
• Key to Multiple Choice Questions	• Explanatory Notes
• Explanatory Notes	4. Gauges 36–50
2. Preventive Maintenance 13–23	<i>Limit Gauges and Fixed Gauges, Grade as per Indian Standard, Protector Slips, Angle Gauges, Sine Bar, Bevel Protractor, Small Hole Gauge, Toolmaker's Buttons, Templates</i>
<i>Maintenance, Total Productive Maintenance, Autonomous Maintenance, Routine Maintenance, Breakdown Maintenance / Corrective Maintenance, Preventive Maintenance, Stages of Preventive Maintenance, Maintenance Schedule, Lubrication Survey, Predictive Maintenance, Zero – Hour Maintenance, Periodic Maintenance</i>	Assignment/Test—Solved..... 46–50
Assignment/Test—Solved..... 21–23	• Multiple Choice Questions
• Multiple Choice Questions	• Key to Multiple Choice Questions
• Key to Multiple Choice Questions	• Explanatory Notes
• Explanatory Notes	5. Surface Finish and Geometrical Tolerances..... 51–61
3. Jigs and Fixtures..... 24–35	<i>Some Other Finishings, Temporary Protectives, Geometrical Tolerance</i>
<i>Jig, Fixture, Advantages of Jigs and Fixtures,</i>	Assignment/Test—Solved..... 57–61
	• Multiple Choice Questions
	• Key to Multiple Choice Questions
	• Explanatory Notes

6. CNC Technology and Programming..... 62–99

*Introduction to CNC, Numerical Control, CNC Technology, Axis Convention, Features of CNC Machines, CNC Lathe, CNC Milling Machine, CNC Turning Centres, Classification of CNC Systems, Power Supply for CNC Machines, Popular CNC Control Systems, CNC Control Motion, Important Terms Relating to CNC, Machining, **CNC Programming; CNC Turning:** Cutting Tools, Turning, Drilling, Milling, Automatic Tool Changer, Quick Change Tooling, Cutting Parameters, Tool Life, Tool Path, CNC Program – An Example, CNC Simulation, Tool Layout, CNC Machine Problems, CNC Milling Machine Trouble Shooting, Maintenance of CNC Machines, Fixed or Canned Cycles, Taper Threading, Direct Numerical Control (DNC), CAM, **CNC Terminology***

Assignment/Test—Solved 95–99

- Multiple Choice Questions
- Key to Multiple Choice Questions
- Explanatory Notes

7. Advance Turning 100–142

***Heat Treatment:** Heat Treatment and its Purpose, Microstructure of Steel, Heat Treatment Process, Annealing, Normalising, Hardening, Tempering, Case Hardening, Age Hardening, Heat Treatment of Cutting Tools, Heat Treating of Alloy Steels, Heat Treating of Cast Iron, Furnaces for Heat Treatment,*

*Measurement of Furnace Temperature, Heat Treatment of Non-Ferrous Metals, Safety Precautions, Ferrous and Nonferrous Metals, **Wrought Iron, Steel And Nonferrous Metals:** Wrought Iron, Steel, Non – Ferrous Metals, Non-Ferrous Alloys, Identification of Metals, **Quality Control:** Quality, Visual Inspection, PDCA Cycle Model, **Basic SPC (Statistical Process Control):** Seven Tools of Quality Control, **Technical English:** Process Chart, Activity Log, Cycle Time, Manufacturing Cost Estimate, Productivity, Job Card, Bill of Material (BOM), In-Process Quality Inspection, **Engineering Terminology:** Technical English Abbreviations, **Terms Used in Part Drawings and Interpretation of Drawings; Special Machines,** Turret Lathe, Types of Turret Lathes, Capstan Lathe, Capstan and Turret Lathe Operations, Turret Tooling Layout, Capstan and Turret Lathes Mechanism, Turret and Capstan Lathe Tools, Tool Holding Devices, Cutting Speed, Turret and Capstan Lathe Size, Cutting External Threads on Turret / Capstan Lathes, Cutting Internal Threads on Turret / Capstan Lathes, Copying Lathe, Tool Room Lathes, Relieving Lathe, Automatic Lathes, Tools and Equipments for Automatic, Lathes, Jig Boring Machine*

Assignment/Test—Solved 134–142

- Multiple Choice Questions
- Key to Multiple Choice Questions
- Explanatory Notes

Appendix : 2nd Year Model Papers 1 to 8 (Annual A.I.T.T. Exam – NSQF Level – 4) ... 143–176