



Preface to Latest Edition (NSQF Level-2.5 compliant)



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 of which Craftsmen Training Scheme (CTS) implemented in ITI's is the most important. Prescribing well designed curriculum and putting in place appropriate assessment and certification procedure are among the vital aspects of vocational training.

As per normal practice followed by DGT, the curriculum is kept updated through necessary changes / modifications from time to time, and so has been the case with the trade **Welder** also, of which Version 3.0 has been released and brought into force. This latest curriculum, as expected and desirable, has introduced some important and relevant topics in the current development scenario, especially relating to learning welding skills in virtual environment before practicing in actual working conditions, which has obvious benefits. With this end in view, latest curriculum includes the topics - **Green Welding Simulator and benefits of its use, Hybrid Training Experience in Welding.**

In order to keep this volume updated, we have prepared a supplement covering in necessary details all such additional topics including relevant Multiple-Choice Questions, which have been added to the already existing volume. As such the trainees of **Welder** trade would find this volume helpful in all respect.

This latest edition continues to follow the already well-accepted pattern of **3-in-1 volume** viz.,

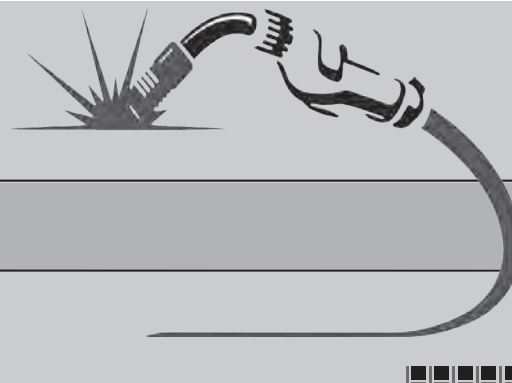
1. Trade Theory
2. Multiple Choice Questions (MCQs)
3. 10 Model Papers (Solved) for A.I.T.T. Exam (CBT) including Latest Bharat Skills Sample Papers MCQs

We sincerely hope that trainees will find this latest edition of book very much helpful to adjust with the latest and updated curriculum of **Welder** trade. We ever remain open to suggestions from our readers for further improvement of this book in its subsequent editions.

— Author

This book covers the syllabus of trade theory subject for the following ITI trades as well:

- Welder (GMAW & GTAW)
- Welder (Pipe)
- Welder Structural
- Welder (Fabrication and Fitting)
- Welder (Welding and Inspection)



Contents

NSQF (Level-2.5) Latest Competency-based Curriculum for Welder Under CTS (1200 Hours)..... vii – viii

MODULE	PAGES	
1. INDUCTION TRAINING AND WELDING PROCESSES.....1–19		
<i>Introduction, 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, Metal Joining Processes; Mechanical Fastening, Nuts and Bolts, Stud, Set Screws, Grub Screws, Thumb Screws, Riveting, Shapes of Rivet Heads, Advantages and Disadvantages of Riveting, Riveted Joints, Soldering, Brazing, Seaming, Hemming, Fusion Welding, Welding Versus Riveting, Welding Processes, Safety; Welding Safety Checklist, Safety in Storage and Handling of Cylinders, General Welding Safety Tips, Fire Safety</i>		<i>Arc Welding Current, Welder's Accessories, Jigs and Fixtures, Manipulators and Positioners, Welded Joints; Types of Welded Joints, Edge Preparation Before Welding, Welding Positions, Preparation of Plates Prior to Welding, Preparation of Curved Section (E.G. Pipes), Stringer Beads, Welding Adjustments (Variables), Arc Length, Welding Defects, Bead Types, Supplementary Symbols, Dimensioning of Welds, Common Terms [IS:812-1957], Arc Blow, Electrodes; Electrodes, Electrode Coating, Coding of Electrodes, Indian System of Coding of Electrodes According To IS: 814 – 1991, Elongation and Impact Properties, Welding Position, Radiographic Quality Electrodes, Selecting the Correct Electrode, Storage of Electrodes, Distortion In Welding; Kinds of Distortion, Steps Taken to Control Distortion, Prevention and Control of Distortion, Flame Straightening, Electrical Terms; Arc Welding Terms</i>
MCQs ■ Answers ■ Explanatory Notes	17–19	MCQs ■ Answers ■ Explanatory Notes 94–100
2. WORKSHOP PRACTICE 20–60		
<i>Basic Fitting; 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, Cold Chisels; Chisel, Chipping Operation, Grinding of Chisel, Method of Chipping, 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, Metal Cutting Machines; Hand Bench Shear, Guillotine Shear, Press Machine, Punching and Blanking, Nibbling, Bending Operations; Cold Bending, Hot Bending</i>		4. GAS WELDING 101–139
MCQs ■ Answers ■ Explanatory Notes	56–60	<i>Gas Welding Process; Process, Oxy-Acetylene Flame, Types of Flame, Flame Characteristics, Lighting the Torch, Backfire and Flashback, Causes of Abnormal Flame, Shutting Off the Torch, Fuel Gases, Flame Temperature, Combustion Ratio, Heat of Combustion, Reaction with Oxygen, Melting Point of Common Metals, Production of Gases, Electrolysis of Water, Acetylene, Calcium Carbide, Storage of Calcium Carbide, Acetylene is Explosive, Production of Acetylene, Acetylene Generator, Water-To-Carbide Generator, Carbide-To-Water Generator, Purification of Acetylene, Properties of Acetylene, Gas Welding Equipment; Oxygen Cylinder, Cylinder Valve, Acetylene Cylinder, Dissolved Acetylene, Advantages of D.A., Regulators, Gauges, Hydraulic Back Pressure Valve (Fig. 33), Hoses, Care of Hose, Hose Connection, Welding Torches, High Pressure Torch, Low Pressure Torch, Welding Tips, Nozzle Sizes, Tip Cleaning, Gas Leaks, Prevent Injury, Filler Rods and Fluxes, Fluxes, Gas Economiser, Manifolds, Gas Welding Procedures; Setting Up the Oxy-Acetylene Plant, Welding Positions, Basic Welded Joints (Fig. 69), Welding Techniques, Pressure Gas Welding, Gas Welding Terms</i>
3. ARC WELDING 61–100		MCQs ■ Answers ■ Explanatory Notes 134–139
<i>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,</i>		

5. GAS CUTTING	140–154	9. INSPECTION AND TESTING.....	201–216
<i>The Oxidation Principle, Cuttability of Metals, Types of Cutting Processes, Gas Cutting, Gouging, Aid to Cutting, Gas Cutting Machines, Powder Cutting, Oxygen Lance, Underwater Cutting; Oxy-Arc Cutting, Arc Cutting, Plasm Arc Cutting</i>		<i>Inspection Before Welding, Inspection During Welding, Common Welding Mistakes, Inspection After Welding, Non-Destructive Tests, Dye Penetrant Inspection, Fluorescent Penetrant Inspection, Magnetic Particle Test, Radiographic Inspection, Ultrasonic Testing, Destructive Testing, Welding Codes, Welding Costs</i>	
MCQs ■ Answers ■ Explanatory Notes	152–154	MCQs ■ Answers ■ Explanatory Notes	215–216
6. WELDABILITY OF METALS.....	155–176	10. GAS METAL ARC WELDING	217–228
Weldability; Classification of Steels, Plain Carbon Steels, Weldability of Carbon Steels, Importance of Pre-Heating and Post-Heating, Other Considerations Welding Of Stainless Steel; Uses of Stainless Steel, Gas Welding of Stainless Steel, Arc Welding of Stainless Steel, Weld Decay, Resistance Welding, Brazing, Soldering, Welding of Cast Iron; Introduction, Composition of Cast Iron, Classes of Cast Iron, Gas Welding of Cast Iron, Arc Welding of Cast Iron, Braze Welding of Cast Iron, Braze Surfacing, Welding of Copper; Welding of Deoxidised Copper, Electric Arc Welding of Copper, Welding of Copper with Carbon Arc, Tig Welding of Copper, Braze-Welding Copper, Spot Welding of Copper, Welding of Aluminium; Oxy-Acetylene Welding Wrought, Aluminium, Oxy-Acetylene Welding of Aluminium, Castings, Arc Welding of Aluminium, Tig Welding of Aluminium, Mig Welding of Aluminium, Atomic Hydrogen Welding of Aluminium, Soldering of Aluminium, Welding of Brass; Uses of Brass, Oxy-Acetylene Welding, Electric Arc Welding of Brass, Welding of Bronze		<i>Equipment, Operation, Quality, Safety, Metal Transfer Modes, Advantages of Mig / CO₂ Welding Flux-Cored Arc Welding</i>	
MCQs ■ Answers ■ Explanatory Notes	174–176	MCQs ■ Answers ■ Explanatory Notes	227–228
7. BRAZING AND SOLDERING	177–188	11. GAS TUNGSTEN ARC WELDING	229–243
<i>Brazing, Braze Welding, Bronze Welding, Carbon Arc Brazing, Brazing with a Liquid Flux, Soldering, Soldering Safety</i>		<i>Tig Welding, Operation, Safety, Applications, Quality, Equipment, Welding Parameters, Arc Ignition, Preparation of Parts, Joint Preparation, Operating Technique, Pulsed Current Tig, Weld Defects, Plasma Arc Welding</i>	
MCQs ■ Answers ■ Explanatory Notes	188–188	MCQs ■ Answers ■ Explanatory Notes	241–243
8. PIPE WELDING.....	189–200	12. RESISTANCE WELDING	244–249
<i>Welding Positions, Basic Pipe Welding Procedure, Oxy-Acetylene Welding of Pipe, Inert Gas Arc Welding Pipe Joints, Pipe Vice, Cutting Pipes, Pipe Cutter, Pipe Bending, Pipe Bending Machines</i>		<i>Seam Welding, Projection Welding, Resistance Butt Welding, Flash Butt Welding, Weld Defect, Weld Inspection and Testing</i>	
MCQs ■ Answers ■ Explanatory Notes	198–200	MCQs ■ Answers ■ Explanatory Notes	249–249
		13. OTHER WELDING PROCESSES.....	250–273
		Submerged Arc Welding; Features, Thermit Welding; Friction Welding; Friction Stir Welding (FSW); Laser Beam Welding; Hard Facing; Surfacing with Oxy-Acetylene, Surfacing with Arc, Stelliteing, Oxy-Acetylene Method of Stelliteing, Metallic Arc Method of Stelliteing, Metallizing, Thermal Spraying, Welding of Plastics; Welding Thermoplastics, Welding In Virtual Environment; Green Welding Simulators and their Benefits, Virtual Environment in a Welding Shop, Green Welding Simulator, Hybrid Training Experience in Welding.	
		MCQs ■ Answers ■ Explanatory Notes	270–273

**Appendix: Model Papers 1 to 10 (A.I.T.T. Exam (CBT) with Bharat Skills MCQs
NSQF Level - 2.5)**

274–320