## Preface to Latest Eddition (NSQF Level-3 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.

Mechanic Diesel (Sector: Automotive) is one among the top few popular ITI designated trades and is of one-year duration. DGT in September 2022 issued latest revised version (version 2.0 of July 2022) of the syllabus, which came into force with effect from 2022 session of admission in ITI's. The main significant change has been that NSQF level for this trade has been revised from four to three. In view of the fact that training in ITI's is primarily practical-oriented, major part of training time (70%) is devoted to practical. In consideration of this important part of training, 150 hours has now been set aside for on-the-job training (OJT) / group project.

This book fully covers the professional skill (trade practical) part of the latest 2022 syllabus. Besides incorporating relevant skill information, each practical exercise comprises of necessary information relating to objective, material, tools, equipment and instruments required, the job sequence etc. Besides practical exercises relating to all aspects of Diesel Engine per se, adequate number of exercises concerning allied topics like Marking & Measuring, Fastening & Fitting Operations, Electric & Electronic Circuits, Arc & Gas Welding, Hydraulic & Pneumatic Circuits etc. have also been included as prescribed in the syllabus.

An added feature is that a set of 32 most important practical jobs, as often appeared in All India Trade Tests, has been compiled for the benefit of trainees to familiarise themselves with and practice such jobs and thus prepare well for the final trade test.

We sincerely hope that trainees will find this book very much helpful to adjust with the latest changes in syllabus related to Mechanic Diesel Trade Practical. We would welcome suggestions for further improvement of this book in its subsequent editions.

— Author

## **C**ONTENTS

Chapter			Page No.
NSQF (Level-3)	Complia	nt Competency based Curriculum Mechanic Diesel Trade Practical (2022 Syllabus)	(ix–xii)
Chapter 1: Too	ols, Equi	pment and Machinery	3–52
Chapter 2: Sa	fe Workiı	ng Practices	53–57
		Identifying Safety Gear / Personal Protective Equipment	
	ercise 2:	Using Fire Extinguisher	
Exe	ercise 3:	Applying Energy Saving Tips In Electricity Usage In The ITI	57
Chapter 3: Ma	ırking an	d Measuring	58–93
		Using Marking Aids For Marking	
	ercise 2:	Measuring Wheelbase of A Vehicle	
Exe	ercise 3:	Measuring Valve Spring Tension Using Spring Tension Tester	
Exe	ercise 4:	Removing Wheel Lug Nuts Using Air Impact Wrench	67
Exe	ercise 5:	Measuring Cam Height, Crankshaft Journal And Crank Pin Diameter, Valve Stem Diameter, Piston Diameter, Piston Pin Diameter	69
Exe	ercise 6:	Measuring Height of Rotor of An Oil Pump With Depth Gauge	72
Exe	ercise 7:	Measuring Valve Spring Free Length	75
Exe	ercise 8:	Measuring Cylinder Bore	
	ercise 9:	Measuring Connecting Rod Bore	
		Measuring Crankshaft End Play	
		Measuring Crankshaft Run-out	
		Measuring Inside Diameter of Valve Guide	
		Checking Flatness of Cylinder Head	
		Checking End Gap of Piston Ring	
		Measuring Piston-to-cylinder Gap	
		Checking Engine Manifold Vacuum	
Exe	ercise 17:	Checking Air Pressure In Vehicle Tyre	92
Chapter 4: Fas	stening a	and Fitting Operations	94–143
Exe	ercise 1:	Checking Nuts And Bolts of Connecting Rod	94
Exe	ercise 2:	Removing Stud / Bolt From Blind Hole	95
Exe	ercise 3:	Using A Hacksaw	97
Exe	ercise 4:	Using A Chisel	99
Exe	ercise 5:	Sharpening A Chisel	102
Exe	ercise 6:	Sharpening Centre Punch And Scriber	104
Exe	ercise 7:	Hacksawing And Filing	106
Exe	ercise 8:	Performing Soldering	108
Exe	ercise 9:	Performing Brazing	110
Exe		Making A Gasket	
		Drilling Clear and Blind Holes	
		Observing Safety Precautions While Using A Drilling Machine	
		Re-sharpening A Twist Drill	
		Tapping Clear And Blind Holes	
		Cutting Threads on A Bolt / Stud	
		Reaming A Hole	
		Scraping A Surface	
		Making Rectangular Tray	
		J J ,	

CONTENTS			(v)
	Exercise 19:	Bending A Pipe By Hot Method	135
	Exercise 20:	Bending A Pipe By Cold Method	137
	Exercise 21:	Soldering Copper Pipes	140
	Exercise 22:	Brazing The Pipes	142
Chapter 5:	Electrical a	and Electronic Circuits	144–187
оп <b>и</b> рост от	Exercise 1:	Joining The Wires Using Soldering Iron	
	Exercise 2:	Measuring Voltage, Current And Reistance With Multimeter	
	Exercise 3:	Making Continuity Test For Fuses And Jumper Wires	
	Exercise 4:	Verifying Ohm's Law	
	Exercise 5:	Performing Voltage Drop Test	
	Exercise 6:	Cleaning Lead Acid Battery Terminals	
	Exercise 7:	Topping Up Lead Acid Battery	
	Exercise 8:	Testing Battery With Hydrometer	
	Exercise 9:	Charging The Battery	
	Exercise 10:	Constant Current Method	
	Exercise 11:	Constant Voltage Method	171
		Parasitic Battery Drain	
		Jump Starting	
	Exercise 14:	Checking Solenoid Switch	174
	Exercise 15:	Checking Relay In Horn Circuit	175
	Exercise 16:	Identify Different Types Of Diodes	177
	Exercise 17:	Identify Pnp And Npn Transistors	182
	Exercise 18:	Constructing 'Or' Logic Gate Circuit	184
	Exercise 19:	Constructing 'And' Logic Gate Circuit	186
	Exercise 20:	Constructing 'Not' Logic Gate Circuit	187
Chapter 6:	Arc and Ga	s Welding	188–205
	Exercise 1:	Making Straight Beads, Butt Joint, Lap Joint, T-joint By	
	Exercise 2:	Setting Up Oxy-acetylene Welding Plant	196
	Exercise 3:	Depositing Fusion Run By Gas Welding Process Without Using Filler Wire In Flat Position	
	Exercise 4:	Depositing Fusion Run By Gas Welding Process Using Filler Wire In Flat Position	203
	Exercise 5:	Welding Closed Square Butt Weld By Oxy-acetylene Gas Welding	204
Chapter 7:	Hydraulics	and Pneumatic Circuits	206–218
	Exercise 1:	Performing Liquid Penetrant Test	206
	Exercise 2:	Performing Magnetic Particle Test	
	Exercise 3:	Identifying Clutch Components On A Vehicle	
	Exercise 4:	Tracing Hydraulic Power Steering System	
	Exercise 5:	Tracing Hydraulic Brake System	
	Exercise 6:	Identifying Components In Air Brake System	218
Chapter 8:	Vehicle Spe	ecifications	219–227
	Exercise 1:	Identifying Different Types Of Vehicles	
	Exercise 2:	Demonstration Of Vehicle Specification Data	
	Exercise 3:	Identifying Vehicle Information Number (Vin)	
Chapter 9:		ition Equipment	
J. Laptor V.		Identifying Garage, Service Station Equipment	
Chapter 10		ng and Assembling Diesel Engine	
σπαρισι Τι		Identifying Parts Of Internal Combustion Engine	
	EACTOISE 1.	racinarying rates of internal compastion Engine	200

(vi)		CONTENTS
Exerci	ise 2: Starting And Stopping Of Diesel Engine	237
Exerci	ise 3: Dismantling And Assembling Diesel Engine	240
Chapter 11: Over	rhauling Engine Parts	247–295
Exerci	ise 1: Overhauling Cylinder Head Assembly	247
Exerci		
Exerci	· ·	
Exerci	·	
Exerci		
Exerci		
Exerci		
Exerci	ise 8: Overhauling An Oil Pump	269
Exerci	ise 9: Removing And Installing Connecting Rod Bush	272
Exerci	ise 10: Removing And Installing Piston Rings	274
Exerci	ise 11: Overhauling Crankshaft	276
Exerci	ise 12: Removing Harmonic Balancer / Damper	282
Exerci	ise 13: Measuring Crankshaft Journal For Wear, Taper And Ovality	283
Exerci	ise 14: Removing And Checking Camshaft Assembly	285
Exerci	ise 15: Overhauling Cylinder Block	288
Exerci	ise 16: Checking Cylinder Bore	290
Exerci	ise 17: Measuring Compression Pressure	292
Chapter 12: Testi	ing Cooling and Lubrication Systems	296–313
Exerci	ise 1: Checking And Topping Up Coolant	296
Exerci	ise 2: Testing Cooling System Pressure	299
Exerci	ise 3: Servicing Radiator	300
Exerci	ise 4: Testing The Thermostat Valve	304
Exerci	ise 5: Overhauling Water Pump And Refitting	306
Exerci	ise 6: Changing Engine Oil	308
Exerci	ise 7: Servicing of Air Cleaner (Dry Type)	310
Exerci	ise 8: Servicing of Air Cleaner (Wet Type)	311
Chapter 13: Testi	ing Intake and Exhaust Systems	314–320
Exerci	ise 1: Overhauling Turbocharger	314
Exerci	ise 2: Servicing Inlet Manifold, Exhaust Manifold, Silencer And Tail Pipe	318
Chapter 14: Serv	vicing Fuel System	321–330
Exerci	ise 1: Servicing Fuel Tank And Fuel Lines	321
Exerci	•	
Exerci	•	
Exerci	ise 4: Bleeding Fuel System	326
Exerci	ise 5: Cleaning And Testing of Fuel Injector Nozzles	327
Exerci	ise 6: Setting The Fuel Injection Pump Timing	329
Chapter 15: Over	rhauling Stationary Engine	331–332
Exerci	ise 1: Starting The Engine And Adjusting Idling Speed With Pneumatic Governor	331
Chapter 16: Mon	itoring Emission	333–344
Exerci	ise 1: Using Engine Exhaust Analyser	333
Exerci	ise 2: Using Diesel Smoke Meter	335
Exerci	ise 3: Checking The Evap Canister	337
Exerci	ise 4: Checking Tank Pressure Control Valve	338
Exerci	ise 5: Inspecting Evaporative (Evap) Canister Purge System With Use of Scan Tool	339
Exerci	<b>9 9</b>	
Exerci	ise 7: Inspecting And Cleaning Egr Valve	344

CONTENTS		(vii)
Chapter 17: Overhauli	ing Alternator and Starter Motor	345–348
Exercise 1:	Overhauling And Testing Alternator	345
Exercise 2:	Servicing The Starter Motor	347
Chapter 18: Troubleshooting		349–351
Exercise 1:	Troubleshooting	350
Chapter 19: Project Work		352–355
Trade Practical John		356