

**MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION, MUMBAI - 51**

1	Name of Course	<b>C.C.In Diesel Fuel Injection And Wheel Alignment Technician (306106)</b>																																								
2	Max.Nos. of Student	25 Students																																								
3	Duration	6 Month																																								
4	Type	Part Time																																								
5	Nos Of Days / Week	6 Days																																								
6	Nos Of Hours /Days	4 Hrs																																								
7	Space Required	Theory Class Room – 200 sqft    Workshop – 400 sqft																																								
8	Entry Qualification	VII <sup>th</sup> passed																																								
9	Objective Of Syllabus/ introduction	Successful candidate would be able to Repairing of Diesel Fuel Injection pumps and make wheel alignment.																																								
10	Employment Opportunity	Self Employment / May get job in Establishment																																								
11	Teacher’s Qualification	Diploma in Automobile, I.T.I. With N.C.V.T. With 1 yr. exp.																																								
12	Training System	<div>Training System Per Week</div> <table><tr><td>Theory</td><td>Practical</td><td>Total</td></tr><tr><td>6 Hours</td><td>18 Hours</td><td>24 Hours</td></tr></table>						Theory	Practical	Total	6 Hours	18 Hours	24 Hours																													
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## **Theory – I**

### **Diesel Injection and wheel alignment**

1. Fuel supply layouts in diesel engines
2. Nomenclature of different types of fuel injection pumps
3. Working principle of FIP
4. Components of an FIP and detailed functioning of each one of them
5. Differences between different types of fuel injection pumps
6. Working principle of Injection Timers and Governors
7. Working principle of Injection Timers and Governors
8. Brief on the FIP Test rig & calibration charts
9. Procedure for phasing & calibration of an FIP
10. Purpose, types, construction & operation of Injectors and nozzles

#### **Wheel Alignment**

11. Safety precautions and first aid. Care and maintenance of tools & equipment
12. Layout of steering & suspension systems, function of each part.
13. Brief on suspension and its effects on steering
14. Steering geometry: Description and purposes of Ackerman steering, toe, castor, camber, king pin inclination/SAI(steering Axis Inclination), turning angle, included angle, set back, thrust angle & frame angle.
15. Pre alignment inspection/checks
16. Two wheel & four wheel alignment
17. Reasons for Alignment problems – steering pull, off-centre steering, steering shimmy, excessive steering effort, poor self centering and memory steer, bump steer, torque steer & steering harshness-alignment diagnostics chart & steering problem diagnostic chart.
18. Components, brief working principle & operation of computerized wheel aligner
19. Procedure to make machine to check wheel alignment
20. Procedure for taking readings using wheel aligner, interpreting alignment readings & repair the same.
21. Procedures for test drive to confirm the repairs.

#### **Wheel Balancing**

22. Meaning of balance, causes & effects of imbalance, vibration. Identification of source, transfer path & responder of vibration(can be felt & can be heard)
23. Analyzing & identifying complaint
24. Procedure for road tests(vibration diagnostic)
25. Steering wheel shake – shimmy, wobble & waddle
26. Brief on static balance, dynamic balance, Mounting errors(radial & lateral) & excessive(Tyre & rim) run out-lateral & radial and mismatches
27. Brief description of wheel balancer(block diagram balancer), fixed data & data to be fed to the machine
28. Procedure for balancing the tyre, rim & assembly
29. Balancing tolerance values
30. Reasons for more imbalance

## **Practical - I**

### **Wheel Alignment**

1. Check tyres, ride height, wheel bearings, ball joints, control arms bushings and sway bars, shock absorbers & struts & power steering
2. Set the aligner ready for wheel alignment tests
3. Check and rectify steering geometry with wheel aligner – take a print out
4. Remove tyre from vehicle
5. Check tyre & rim and also check for run out
6. Do static balancing
7. Fit the wheel assembly on the aligner and check for dynamic imbalance & rectify the defects
8. Fit the tyre assembly to the vehicle

## **Practical - II**

### **Fault finding and replacement of fuel injection pump's parts**

1. Wash / Clean FIP and Injectors
2. Check the FIP on calibration bench and assess the condition
3. Dismantle FIP using special tools
4. Clean and inspect Parts of each components
5. Replace defective components
6. Assemble FIP using special tools
7. Calibrate FIP using calibration test bench
8. Test the Injectors using Injector Tester
9. Replace defective nozzles using special tools
10. Assemble injectors and test

## List of Tools

	Item		Item
1.	Screw drivers	1.	Inspection lamp with guard and wandering lead of 100 ft
2.	File	2.	Horses and wheel chokes
3.	DE Spanner Set	3.	Screw Wrench
4.	Box spanner set	4.	Ring Spanner Set
5.	Hacksaw blade with frame	5.	Wheel aligner bay/ramp/pit with rolling jack
6.	Tyre pressure gauge with accessories	6.	Computerized wheel aligner with all accessories along with manuals & diagnostic charts
7.	Hammer	7.	Wheel changer
8.	Vice	8.	Computerized wheel balancing machine with all accessories
9.	Pliers	9.	Compressor with accessories
10.	Pipe Wrench	10.	FWD Vehicle with workshop Manual & vehicle kit
11.	Hammer ball peen 0.75 kg	11.	Portable electric drill 6 mm
12.	Torque wrenches of different capacity	12.	Latest Diesel 4 Wheelers of different make (one LMV & one HCV) along with workshop manuals
13.	Spanner D E set of 12 pieces (6 to 32 mm)	13.	Injector holders
14.	Pliers combination 15 cm	14.	Mallets (wooden/plastic)
15.	Hand file 20 cm. Second cut	15.	Spanner, ring offset set of 6 (S A E)
16.	Centre punch 10 mm dia x 100 mm	16.	Spanner, adjustable 20 cm.
17.	Chisel cold flat 20 mm	17.	Socket Spanners with handle, T bar & ratchet
18.	Ring spanner set of 12 pieces (6 to 32 mm.)	18.	Oil can 0.5 liter cap
19.	Feeler gauge 20 blades (metric)	19.	Cleaning Tray 45 x 30 cm with 6+1 compartments
20.	Steel tool box with lock & key (folding type) size 400x200x150mm .	20.	Work bench each 250 x 120x60 with 4 bench vices 12 cm jaw
21.	Allen Key set of 12 pieces (2 to 14mm)	21.	Pullers screw powered 2 mm with bearing puller attachment
22.	Allen Key set of 12 pieces (2 to 14mm)	22.	Vice grip pliers
23.	Philips Screw Driver Type set of 5 pieces 100 mm to 300 mm	23.	Circlip pliers Expanding and contracting type 15 cm and 20 cm each
24.	Steel Rule 30 cm, English and metric	24.	Inspection lamp with guard and wandering lead of 100 ft

25.	Prick punch 15 cm	25.	Hollow punch set of seven pieces 6 mm to 15 mm
26.	Scriber 15 cm with scribing block universal	26.	„V“ Block 75 x 38 mm pair with Clamps
27.	Hacksaw frame adjustable for 30 cm blade	27.	Spanner off set double ended set of 7 pieces.(6 mm -17 mm) Set of 12 nos.
28.	Hand vice 37mm	28.	Different types of Fuel Injection Pumps
29.	Drill Twist ( assorted )	29.	Different types of Injectors
30.	Hand reamer adjustable	30.	FIP test Bench along with a set of special tools for repairing & Testing different types of FIPs
31.	Drilling machine	31.	Injector test bench along with a set of special tools for repairing different types injectors