MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION, MUMBAI - 51

<table>
<tr><td>1</td><td>Name of Course</td><td>C.C. in Overhauling of Fuel Injection System & Steering (306112)</td></tr>
<tr><td>2</td><td>Max.Nos. of Student</td><td>25 Students</td></tr>
<tr><td>3</td><td>Duration</td><td>6 Months</td></tr>
<tr><td>4</td><td>Type</td><td>Full Time</td></tr>
<tr><td>5</td><td>Nos Of Days / Week</td><td>6 Days</td></tr>
<tr><td>6</td><td>Nos Of Hours /Days</td><td>7 Hrs</td></tr>
<tr><td>7</td><td>Space Required</td><td>Laboratory = 1000 Sq feet
Class Room = 200 Sq feet
TOTAL = 1200 Sq feet</td></tr>
<tr><td>8</td><td>Entry Qualification</td><td>S.S.C.</td></tr>
<tr><td>9</td><td>Objective Of Syllabus/ introduction</td><td>Awareness of Safety precautions.
Awareness of Various Types of Fuel Injection system in Automobiles.
Awareness of various Controls in Engines.
Awareness of steering system in Automobile.
Awareness of Servicing & Overhauling of Fuel Injection System & Steering in Automobile.
Awareness of Repair & Maintenance of Fuel Injection System & Steering in Automobiles.</td></tr>
<tr><td>10</td><td>Employment Opportunity</td><td>The trainee will either to be able to take up jobs with agencies which Develop, maintain, repair & Overhauling of Fuel Injection System & Steering in Automobiles or with working experience will be in a position to start his own independent Business.</td></tr>
<tr><td>11</td><td>Teacher’s Qualification</td><td>Diploma in Mechanical/Automobile Engineering.</td></tr>
<tr><td>12</td><td>Training System</td><td>Training System Per Week
<table><tr><th>Theory</th><th>Practical</th><th>Total</th></tr><tr><td>12 Hours</td><td>30 Hours</td><td>42 Hours</td></tr></table></td></tr>
<tr><td>13</td><td>Exam. System</td><td><table><tr><th>Sr. No.</th><th>Paper Code</th><th>Name of Subject</th><th>TH/PR</th><th>Hours</th><th>Max. Marks</th><th>Min. Marks</th></tr><tr><td>1</td><td>30611211</td><td>Overhauling of Fuel Injection System & Steering</td><td>TH-I</td><td>3 hrs</td><td>100</td><td>35</td></tr><tr><td>2</td><td>30611221</td><td>Basic of Transmission, Suspension, Steering System & Breaks</td><td>PR-I</td><td>3 hrs</td><td>100</td><td>50</td></tr><tr><td>3</td><td>30611222</td><td>Overhauling of Fuel Injection System & Steering</td><td>PR-II</td><td>6 hrs</td><td>200</td><td>100</td></tr><tr><td></td><td></td><td>Total</td><td></td><td></td><td>400</td><td>185</td></tr></table></td></tr>
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SYLLABUS

Overhauling of Fuel Injection System & Steering

Practical – II	Theory - I
> Dismantle & inspect part of fuel feed pumps > Assemble & test of fuel feed pumps > Dismantle fuel filter assembly > Replace filter elements > Bleed fuel supply system	Types of fuels Specification of fuel Function & working of fuel supply system with fuel system layout Types of filter elements Function & working of plunger type feed pump, AC pump
> Dismantle the FI Pump > Clean & inspect FI Pump > Replace the worn out parts > Assemble the FI Pump > Dismantle & clean the injector & replace its worn-out parts > Assemble the injector & test it to correct pressure	Purpose & types of injector Parts & working of injector Pressure adjusting & testing procedure of injector Purpose & types of FI Pump
> Phasing & Calibrate the FI Pump & governor setting > Check the injection timing by spill cut-off method > Set the fuel injection timing	Parts & working of FI Pump & its overhauling, phasing & calibration Function & types of Governor Functional parts of Governor (pneumatic, RSV & RQV) Principle of operation of mech. Operated low load advance system
> I nflate the wheel to recommended pressure > Fit the wheel on vehicle > Remove front axle of the vehicle > Replace king pin bushes and hub bearings > Check adjust kingpin play > Adjust hub end play > Remove, inspect the shock absorbers and re-fit > Check and adjust turning angle	Importance of tyre inflation to the recommended pressure Importance & method of tyre rotation Types of axles & hubs. Function & working of steering system and power assisted steering system Ackerman geometry of steering.
> Align the steering wheel with front wheel > Dismantle, inspect & assemble the steering gear box > Adjust pre-loading in steering gear box & re-fit > Check toe-in & toe-out, > Check chamber & caster angle > Check king pin inclination & wheel run-out > Bleed air in power assisted steering > Check and adjust wheel alignment and balancing > Rectify hard steering > Rectify trouble of vehicle's pulling to one side	Functional parts of steering geometry Types of steering gear box Importance of camber, castor & king pin inclination Purpose of wheel track & wheel base Function of toe-in & toe-out

Basic of Transmission, Suspension, Steering System & Breaks

Practical – I
Safety precautions in handling asbestos. Dismantling a clutch assembly from the engine, clean and inspect parts for wear and damage. Changing pressure plate and flywheel. Testing the of clutch springs for uniform tension, assembling of pressure plate and spring, adjusting the fingers and aligning clutch with flywheel.
Cleaning, assembling gearshift mechanism, changing oil in the gearbox. Studying different types of oil seals and bearings used in the gearboxes.
Studying the gear ratios in the gearbox. Removing, cleaning and refitting 'U' joints, propeller shaft drive. Dismantling of an old final rear axle assembly, clean and inspect parts, cut packing and gaskets. Remove crown wheel, pinion and bearings, clean parts. Check tooth contact in the crown and pinion and adjust backlash. Assemble rear axle assembly and study its functioning.
Removing and refitting a leaf spring as an assembly in a vehicle, changing rubber bushes of shock absorbers and independent front suspension. Lubrication of suspension units.
Removing and refitting steering boxes from vehicle, checking and topping up oil in steering box. Checking and adjusting steering wheel play and backlash.
Checking and correcting the steering geometry with instruments.
Identification of Pneumatic valves, Components, parts of Air compressor and to draw the symbols. Construction of circuits using single acting cylinder, Double acting cylinder and direction control valve. Construction of circuits for pneumatic power press, pneumatic hammer using double acting cylinder, directional control valve and flow control valve.
Dismantling and assembling of 4 / 3 way directional control valve Dismantling and assembling of flow control valve Dismantling and assembling of Single acting, Double acting and double acting double rod cylinders Dismantling and Assembling of Pressure Control valve Tracing and drawing the hydraulic circuits for the following machines Hydraulic Power hack saw machine
Checking and adjusting hand brakes and pedal play in foot brakes. Dismantling wheel brake assembly– removing old lining and fitting new lining on the brake shoe.
Removing & cleaning of brake drums. Fittings new cups and brake hose pipes – re-assembling. Adjusting all four wheel brakes and testing for brake concern.

List of tools, machinery & equipments

Sl No	Item	Qty.
1	Spanner for spark plugs 14mm.	2 Nos.
2	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm	2No.
3	Adjustable spanner (pipe wrench 350 mm)	2 Nos.
4	Oil can 0.5/0.25 liter capacity	2 No.
5	Cleaning Tray 45x30 cm.	4 Nos.
6	Injector cleaning Kit	2 Kits.
7	Injector dismantling and assembling jig and fixture	1 Kit
8	Injector dismantling tool kit	1 Kit
9	Fuel injection pump dismantling tool kit	1 Kit
10	Torque wrench 12- 68Nm.	1 No.
11	Work bench 250 x 120 x 60 cm with 2 vices 12cm Jaw	2 Nos.
12	Pullers screw powered 2 mm gap with bearing puller attachment	1 No.
13	Vice grip pliers	2 Nos.
14	Circlip pliers Expanding and contracting type 15cm & 20cm	8 Sets.
15	Inspection lamp with guard and wandering lead of 50ft. length	1 No.
16	Crow bar	1 No.
17	Cleaning tray- Aluminum 45 x 30 cm with 6 small compartments	8 Nos.
18	Portable electric drill 6mm	1 No.
19	Circlip pliers 15 cm. Expanding type	1 No.
20	Circlip pliers 15 cm. Contracting type	1 No.
21	Drilling machine bench to drill up to 12mm die	1 No.
22	Chain and pulley block 3000 kg. Capacity electric type	1 No.
23	Horses and wheel choke	4 Nos. each
24	Bearing puller screw powered/hydraulic powered with attachments Max spread 80, 200 and 300mm	1 Each.
25	Hydraulic jack with trolley capacity 3 Ton	1 No.
26	Screw jack one tone, capacity double lift	2 Nos.
27	Fuel feed pump (plunger type)	1 No.
28	Injectors	2 Nos.
29	Surface Plate 60 x 60cm	1 No.
30	'V' Block 75 x 38mm pair with Clamps	2 Nos.
31	Electric pedestal grinder with two 18cm. Wheel	1 No.
32	Wheel alignment gauge	1 set
33	Camber angle gauge	1 No.
34	Fuel injection pump one with pneumatic governor, one with R.Q.V. governor and one with R.S.V. governor, VE pump / DPC pumps	1 Each
35	Wheel balancing machine with accessory	1 set
36	Injector testing set (hand operated)	1 No.

37	Triple leg grip puller with bearings attachment screw/ hydraulic Powered max. spread 80, 160, 250, 450 mm	1 No.
38	Fuel injector cleaning kit (in a wooden box complete)	4 Sets.
39	Engines 4 cylinder petrol MPFI and four cylinder diesel engine other than procured under module 01 and 02.	2Nos.
40	Toe-in, toe-out gauge	1 No.
41	Injector dismantling jig with mounting bench	1 No.
42	Speed counter - pointed type to read up to 5000 RPM	1 No.
43	Special tools for overhauling of inline and distributer type pumps with jigs	1 set
44	Fuel injection pump test bench with accessories	1 No.