



WINTER -14 EXAMINATION
Model Answer

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Important Instructions to examiners:

- 1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
- 2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
- 3) The language errors such as grammatical, spelling errors should not be given more importance. (Not applicable for subject English and Communication Skills).
- 4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
- 5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
- 6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding.
- 7) For programming language papers, credit may be given to any other program based on equivalent concept.

1. A) Attempt any FIVE :	20
a) Give any two examples of hand tools, special tools, measuring tools and equipments.	4
Answer: <i>(Any two examples of each category, each example carries ½ marks.)</i> Hand tools: Spanners (Wrenches), Hammers, Pliers, Screw driver, Files, Chisel, Torque wrench, Hacksaw, Punch, Drill bits, Taps and Dies, Bench Vice etc. Special tools: Piston ring compressor, Piston ring expander, Valve spring compressor, Bearing Puller etc. Measuring tools: Steel rule or Scale, Vernier caliper, Micrometer (Inside & Outside), Depth gauge, Thickness gauge, Wire gauge, Angle checking gauge, Level cum angel gauge, Optical gauge, Telescopic gauge, Dial indicator etc. Equipments: Computerized wheel aligner, Battery charger, Ignition timing Light, Arbor press, Hydraulic press, Hydraulic Jack, Car Lifts, Electric Drill, Head light aligner, Engine analyzer, Vehicle washer, Fuel injector tester, Wheel balancer etc.	4
b) Write the activities required to do in daily maintenance of a car.	4
Answer: The activities required to do in daily maintenance of a car: <i>(Any four- each carry 1 mark.)</i> 1) Check Fuel Level in fuel tank. 2) Check Tyre pressure. 3) Check Braking system. 4) Check Electrical system. 5) Check clutch pedal play. 6) Check coolant level. 7) Mirror adjustments.	4



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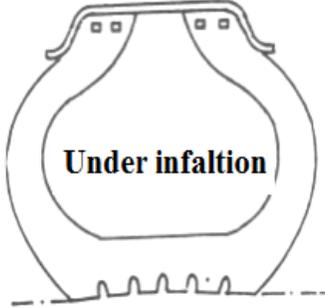
c) Write the meaning of phasing and calibration required in inline FIP of diesel engine.	4
Answer: Phasing in inline FIP of diesel engine: The adjustment of fuel injection pump at correct timing intervals is known as the as the Phasing of the Pump. The camshaft of the pump rotates at half the speed of the crankshaft. Therefore, the supply of oil from each plunger should be at 90 ⁰ differences for a four cylinder engine. This means that the timing of fuel delivery and cut off between one cylinder and the other should be 90 ⁰ . Calibration in inline FIP of diesel engine: FIP is calibrated for efficient delivery, so that quantity of diesel fuel supplied by all the plungers in a given pump is more or less same at any rpm. Calibration of FIP is done on FIP test bench. If these measured quantities differ much, then the quantity of fuel is adjusted by loosening the clamping screw of the toothed quadrant and rotating the plunger by turning the control sleeve of pump.	2 2
d) Write the meaning of clutch plate thickness, run-out, rivet depth and warpage of pressure plate.	4
Answer:(correct meaning of each carries 1 mark) Clutch plate thickness: It means axial height between cushioning spring and friction lining. OR It means axial height between two frictional linings. Run-out: It means clutch plate does not rotate exactly in line with the axis of clutch shaft. Rivet depth: It is the axial distance between head of rivet and friction lining of clutch plate. Warpage of pressure plate: It means hot spots, dark blue discoloured patterns on pressure plate because of excessive heat.	4
e) What is meant by clutch free play and why it is required?	4
Answer: Clutch Free play: The specified amount of play is kept in the clutch linkage after servicing and assembling the clutch to ensure that clutch is fully engaged when the pedal is released and fully disengaged when the pedal is depressed completely. It ensures proper distance between pressure plate and flywheel which in turn adjusts the distance between release bearing and clutch fingers. This will vary slightly from model to model but the usual free play specified is 15 to 20 mm. Requirement of clutch free play: If no free play is kept, it may result in - i) noise and damage to release bearing, ii) slipping of clutch. iii) non uniform wear of clutch plate.	2 2
f) List any two types of lubricants and write their application in HMV.	4
Answer: Types of lubricants and their application in HMV: (Any two – 2 marks each) 1) Engine Oil: Used for lubrication of engine components to minimize wear and tear. 2) Gear Oil: It is used in a vehicle's differential and manual transmission. 3) Transmission Fluid: It lubricates all moving parts in the transmission, cools the transmission, prevents corrosion and conditions the seals. 4) Wheel Bearing and Chassis Grease: It is used in lubrication of wheel hub bearings, the suspension and steering joints. 5) White Grease: White grease is water proof grease designed to work in metal to metal applications where water penetration is a problem 6) Electronic Grease: Used on electrical connections where the heat must not build up. 7) Penetration Lubricants: It is used to loosen and lubricate seized, rusted and corroded nuts and bolts. 8) Graphite: Graphite should be used to lubricate parts that should not be exposed to oils. A common place to use graphite would be in door locks.	4

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g) What is meant by under inflation & over inflation of tyre?	4
<p>Answer:</p> <p>Under inflation of tyre: It means tyre having less air pressure than specified by the manufacturer. When in motion, the tyre is subjected to greater flexure which sharply increases the tyre's internal temperature.</p> <p>Over inflation of tyre: It means tyre having excess air pressure than specified by the manufacturer. Narrower tread width. The tyre's ply cord layers are extremely tense and prone to damage due to external impacts.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Under infaltion</p> <p>Tyre contact with Road Surface</p> </div> <div style="text-align: center;">  <p>Over inflation</p> <p>Tyre contact with Road Surface</p> </div> </div>	1 1 2
2. Attempt any FOUR :	16
a) Write the safety precautions required to take while lifting a car on hoist.	4
<p>Answer: Safety precautions required to take while lifting a car on hoist: <i>(Any four points- 1 mark each)</i></p> <ol style="list-style-type: none"> 1) Follow the lifts manufacturer's instructions on the capability limits of the lift. 2) Ensuring that the arm lock mechanism operates satisfactorily. 3) Checking that all controls are operating properly. 4) Identify the correct jacking/lifting points for the vehicle (check the vehicle user manual if necessary) 5) Ensure the lifting arms are carefully positioned at the correct jacking/lifting points for the vehicle. 6) Consider the weight distribution of the vehicle especially, if large parts (e.g. engine or gearbox) are removed from the vehicle or by the application of force (e.g. forcing off rusted on bolts) which could affect the stability of the vehicle being lifted. 7) Lift the vehicle a short distance to check that the arms have locked by applying some force to them and the pads are properly positioned, before fully elevating the vehicle. 	4
b) Write the functions of wheel balancer and wheel aligner, tyre changer and compressor.	4
<p>Answer: Functions: <i>(function of each carriers 1 mark)</i></p> <p>Wheel balancer: To detect imbalance in the wheel and locate the position of weight to be added.</p> <p>Wheel aligner: This equipment checks and adjusts the misalignment of front wheels. It measures camber, caster, king pin inclination and toe in. It also helps to set these parameters.</p> <p>Tyre changer: It is a device used for mounting and demounting of tyre from wheel rim with less effort. It reduces time for tyre changing.</p> <p>Compressor: To facilitate compressed air supply at various points and pneumatic tool functioning.</p>	4
c) Write the procedure to do FIP calibration.	4

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Answer: Procedure to do FIP calibration:

The FIP is calibrated for efficient fuel delivery. For calibration-

1. Place the pump on a fuel injection test bench.
2. Its engine is then rotated till it attains the speed of 2000 rpm.
3. Measure the quantity of diesel oil supplied by the each pump element in measuring cylinder.
4. If measured quantities are more or less same, it may be said that the pump is delivering properly to all the cylinders.
5. If measured quantity differs much, then the quantity of fuel is adjusted by loosening the clamping screw of the toothed quadrant and rotating the plunger by turning the control sleeve of pump.

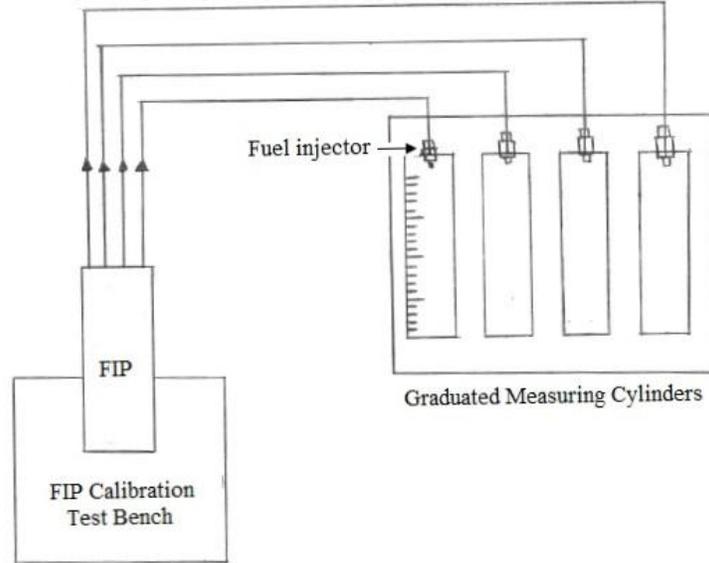
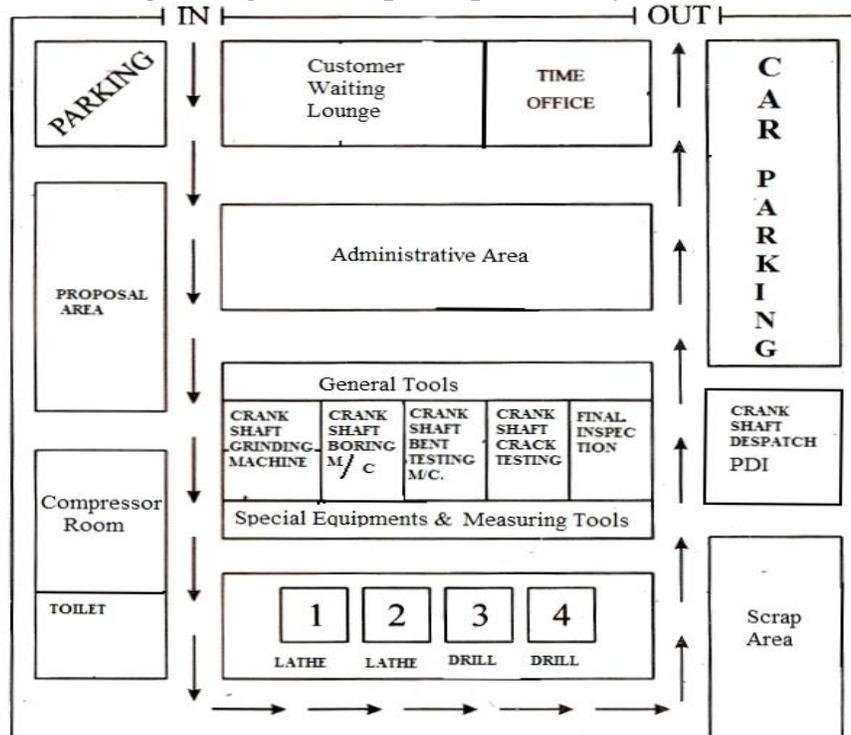


Figure: FIP calibration

d) Draw a layout of crankshaft grinding workshop for specialized job work.

Answer: Layout of crankshaft grinding workshop for specialized job work:





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e) How engine analyzer is useful in correcting engine performance.	4
Answer: Engine analyzer is useful in correcting engine performance: An engine analyzer combines several testers, meters and gauges into a single piece of portable shop equipment. When connected to the vehicle, the analyzer provides quick and accurate testing and diagnosis of various engine and vehicle systems. It includes an oscilloscope. It displays voltage patterns of ignition system, charging system and electronic fuel injectors. Some computerized analyzer includes a second screen which displays information needed by the technician, such as steps in the test procedure or test a result. At the same time, number of checks of engine are performed by engine analyzer like engine rpm, dwell angle, C.B. Point gap, cylinder leakage, oil temperature, exhaust emission, vacuum checking, engine performance, battery charging, engine timing, spark leakage etc. We can compare the result analysis with manufacturer's specification, if any deviation is found we rectify the respective parameters of engine. Hence we correct the engine performance. Engine analyzer saves time and labor in locating engine troubles.	4
f) What is the necessity of maintenance? Write their types.	4
Answer: Maintenance is necessary: (Any three points- each carry 1 mark) 1) In order to ensure satisfactory operation of motor vehicle and trouble free performance of vehicle. 2) Maintenance increases life of vehicle and also it provide safety to passengers and other road users. 3) Maintenance also improves the performance of vehicle, availability for maximum utilization of vehicle and economical operation. 4) To keep vehicle in good running condition, reduce breakdown of vehicle and accidents. 5) To reduce repair cost. Types of maintenance: Preventive maintenance, scheduled maintenance and Breakdown maintenance.	3 1
3. Attempt any FOUR :	16
a) What is the importance of scheduled maintenance?	4
Answer: Importance of scheduled maintenance (Any four points- each carry 1 mark) 1) Scheduled maintenance is operative maintenance in which attention is provided to motor vehicle after an operation in specified time or covered distance. In this, components are serviced periodically i.e. daily, weekly, monthly, yearly or after certain kilometers of travel as mentioned in the manufacturer's service manual, so it ensures trouble free performance and satisfactory running. 2) The vehicle is maintained in good condition; so as to avoid breakdowns, obtain maximum work from vehicle by reducing delays which in turn improves profit of business. 3) Proper planning (good schedules) of labour, material, equipment and vehicles reduce waiting time of vehicle which ensures maximum availability of vehicle for operation. 4) Increases life of the vehicle. 5) More resale value of vehicle. 6) Ensures safety of driver, passengers and other road users. 7) Reduces repairing as well as running cost of vehicle.	4
b) Give any one example of repair and replacement in a vehicle.	4
Answer: Example of repair and replacement in a vehicle: (Any one example of each carry 2 marks) Repair: It is possible to repair number of parts in a vehicle but it is worth to repair such a component or some portion of component which has become ineffective due to wear, fatigue etc. is restored to the substantially original condition or better condition. It means that only those parts are restored which are serviceable and give better performance and more life. Again, the components which are expensive and not available easily in the market is required to be repaired.	



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<p>1) Piston: If the crown, ring lands and skirt are all right and only top ring groove is worn out causing fluttering and compression leak, then seek another second ring which is thicker than the top ring. This can be used to widen the groove, so as to maintain proper clearance and the old piston can be reused.</p> <p>2) Air Cleaner: Air cleaner often gets choked and causes restriction to the air flow into the cylinder. To overcome this, the choked or used wire mesh element can be replaced with a new mesh and also a protecting gauge to top and bottom of this mesh is provided, so that no broken mesh particles enter into inlet manifold.</p> <p>3) Gearbox casing: If the parent bore in casing gets elongated due to wear, this can be repaired by machining and then fitting a sleeve. However, instead of sleeving, Rototech and Metal wiring process is more economical.</p>	2
<p>Replacement:</p> <p>1) Bearings, oil seals, Belts, Clutch springs, Clutch finger, Thrust Washer etc.: The parts work adequately up to certain point and then they fail; since these parts cannot be repaired, the only alternative is to replace them with new one. These parts are called sudden failure parts and have a specified life.</p> <p>2) Vehicle, Machine tools, gear box, Fuel Pump, Shock absorber Clutch housing etc.: These units or parts are called as deteriorating parts. These can be kept functioning though they are giving substandard performance and increased amount of running maintenance cost and are replaced after breakdown or in the planned replacement or in group replacement situations.</p>	2
<p>c) List the parameters which are covered in history sheet of vehicle.</p>	4
<p>Answer: Parameters covered in history sheet of vehicle: (Any four- each carry 1 mark)</p> <p>1) Vehicle details- Registration number, odometer reading, 2) Owner's details- Name, address, contacts number. 3) Date of repairing. 4) The amount spent on the maintenance of vehicle. 5) Type of maintenance- unscheduled, scheduled, in warranty, refit, repairs, accident. 6) Reason for such repair.</p>	4
<p>d) List the causes if engine leads to seizure.</p>	4
<p>Answer: Causes of engine leads to seize:</p> <p>A) Overheating.</p> <p>1. A low coolant level 2. Defective cooling system. 3. Faulty thermostat</p> <p>B) Lack of Lubrication.</p> <p>1. Low oil pressure. 2. Defective oil pump. 3. Defective lubrication system.</p> <p>C) Detonation.</p> <p>D) Incorrect assembly of engine parts.</p> <p>1. Incorrect engine bearing clearances. 2. Insufficient Valve-to-Piston Clearance or Piston-to-Cylinder clearance. 3. Failure to clean parts properly during engine assembly. 4. Failure to lubricate parts properly during engine assembly.</p>	4



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e) List any four troubles which may occur in cooling system.	4
Answer: Troubles in cooling system. (Any four points. Each point carry one mark) 1) Loss of water. 2) Leak in radiator 3) Choked or leaky hose pipe. 4) Leaking of water from water drain cock. 5) Leaking of head gasket. 6) Loose or slippage, defective V-belt. 7) Broken blades of fan. 8) Incorrect fan angle. 9) Choked radiator core, fins. 10) Leaky, defective water pump 11) Defective thermostat valve.	4
f) What will happen if ECT sensor becomes inoperative and if O ₂ sensor becomes inoperative?	4
Answer: Engine coolant temperature sensor (ECT) becomes inoperative. 1) It will send the wrong voltage to the computer – or may not send voltage data at all. 2) If the wrong voltage tells the ECM that the engine is cold when it is at operating temperature, the engine will run rich, meaning it will use more fuel and cause your fuel economy to take a dive. 3) The engine has overheated so that all the water boiled over and out of the system. If O₂ Sensor becomes inoperative. 1) One case would be drastic decrease of fuel economy or mileage. 2) Other reasons may include engine hesitation, engine stalling, increased exhaust emission, rough idling and engine pinning. 3) It leads to lowered performance of the engine and poor fuel efficiency which ultimately decreases your vehicle's driveability.	2 2
4. Attempt any TWO :	16
a) Write the procedure to check i) Cylinder liner ii) Piston iii) Cylinder Head iv) Crankshaft	8
Answer: Procedure to check: i) Cylinder liner: Check Cylinder Liner Ridge Protrusion: 1) Using a cylinder bore gauge, measure the ridge protrusion of the cylinder liner, If the protrusion is not within specifications, adjust it with a cylinder liner shim. 2. Check cylinder liner for Taper wear: Move the cylinder bore gauge or internal micrometer from top to bottom of cylinder. Note the readings at top and bottom. The difference in these reading is taper. $\text{Taper Wear} = \text{Measurement at TDC} - \text{Measurement at BDC}$ 3. Check cylinder liner for Oval wear (Ovality): Take the measurements A and B with cylinder bore gauge at TDC where maximum wear is observed as shown in figure. The difference between in these readings is ovality.	2

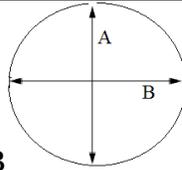


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Ovality or Out of round wear = $A - B$

4. Inspect cylinder Liner for Vertical scratches: Visually check the cylinder liner for vertical scratches. If deep scratches are present, replace the cylinder liner.

ii) Piston:

- a) Clean the piston to remove dirt, carbon depositions etc.
- b) Check piston diameter and oil clearance.
- c) Check the piston ring groove clearance with the help of feeler gauge.
- d) Inspect the condition of piston skirt for wear.
- e) Check the oil holes in the oil ring groove.

2

iii) Cylinder Head:

- a) Remove carbon deposits from cylinder head surface and clean the head.
- b) Check head for Warpage by means of straight metal rule placed against machined surfaces in number of directions.
- c) Inspect head for cracks in the exhaust ports, combustion chambers, water chambers.
To detect cracks in head, wet the head with kerosene with a clean cloth and strike again lightly.
The cracks will shows up clearly.
- d) Inspect gasket surfaces for excessive scratches.
- e) Inspect bolt hole threads for debris or damaged threads.

2

iv) Crankshaft:

- a) Check the cracked or worn out front hub key slot.
- b) Check oil holes for clogging and damage by compressed air.
- c) Check crank shaft for straightness with the help of dial gauge.
- d) Checkout of round and taper wear of crankshaft main journal and crankpins.
- e) Check static and dynamic balancing of crankshaft on crankshaft balancing machine.
- f) Check end play of crank shaft when fitted in block by using dial gauge or feeler gauge.
- g) Check crankshaft bearing oil clearance.

2

- b) Write the procedure to check
 - i) TPS
 - ii) MAP sensor
 - iii) Injector
 - iv) IAC motor

8

Answer: **Procedure to check:**

i) TPS

Throttle position sensor detects the position of throttle valve and sending the signals to ECU for controlling the mixture of air fuel.

Procedure:

- 1) Disconnect negative cable at battery and coupler from TP sensor.
- 2) Using Ohm meter or multi meter, check resistance between terminals under each condition and compare

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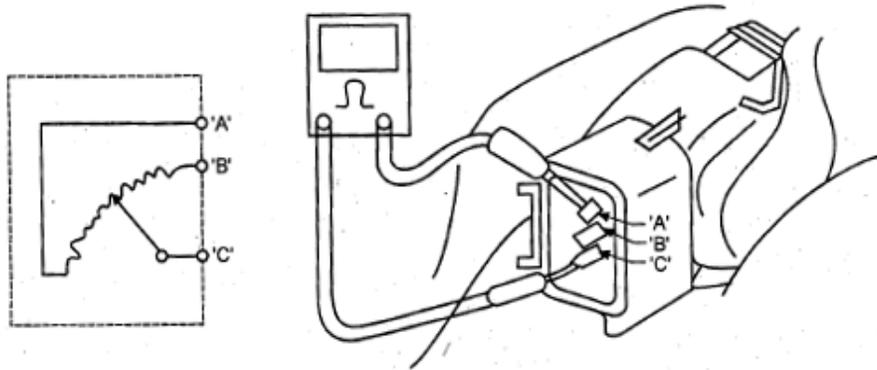
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to the specified value given by manufacturer as given below-

Terminals	Resistance	
Between 'A' and 'B' terminals	2.5 – 6.0 kΩ	
Between 'A' and 'C' terminals	Throttle valve at idle position	0.17-11.4 kΩ
	Throttle valve fully open	1.72-15.50 kΩ

2

- 3) There should be more than 1.5 ohm resistance difference between when throttle valve is an Idle position and when it is fully open.
- 4) If check result is not satisfactory, replace TP sensor.



'A' - Ground Terminal, 'B' - Reference Voltage Terminal, 'C' - Output Voltage Terminal

Figure: Inspection of TP Sensor

ii) MAP sensor

- a) Disconnect MAP sensor vacuum hose from filter.
- b) Disconnect coupler from MAP sensor.
- c) Remove MAP sensor.
- d) Arrange three new 1.5 V batteries in series and connect its positive terminals to "V in" terminal of sensor and negative terminal to "ground" terminal. Check voltage between V out and ground. Also check if voltage reduces the vacuum is applied up to 40 cm Hg by using vacuum pump.
- e) Output voltage (V in : 4.5- 5.0 V, ambient temperature 20-30°C)
- f) If check result is not satisfactory, replace MAP sensor.
- g) Install MAP and connect vacuum hose securely.
- h) Connect MAP sensor coupler securely.

2

iii) Injector: Procedure for solenoid –operated fuel injector:

Three tests may be performed on a solenoid- operated fuel injector. These tests are for resistance, volume or flow and leakage.

1) Injector resistance: Check the injector resistance with an ohmmeter. Remove the wiring- harness connector from the injector. Connect an ohmmeter lead to each of the injector terminal. Replace the injector if the resistance is not within the manufacturer's specification.

2

2) Injector flow or volume: Connect a fuel injector tester to the fuel system. Follow the tester operating instructions. The procedure determines whether the volume of fuel flow through each injector is within specifications.

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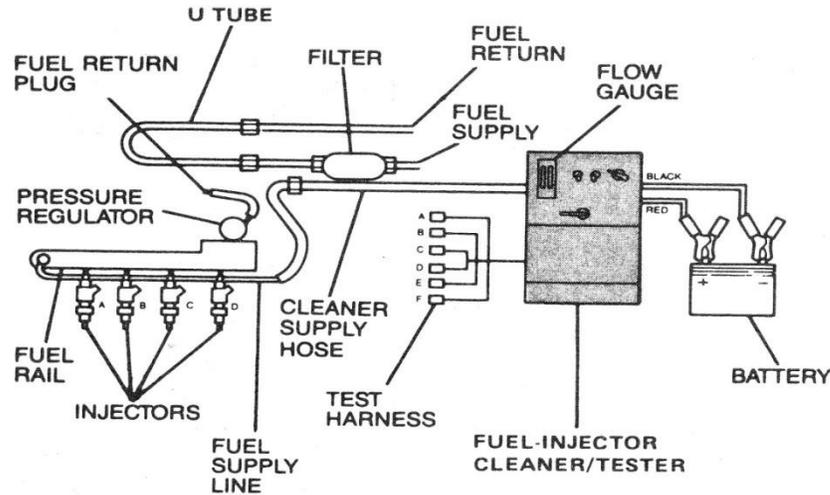


Fig. fuel injector tester.

A similar test can be made with an injector balance tester. The test is made with engine off, ignition key on, and the pressure gauge connected to the fuel system. The tester opens each injector for the same length of time. The pressure gauge shows the amount of pressure drop. All injectors should have about the same pressure drop. A partially clogged injector has less pressure drop than a clean injector. Clean or replace any injector that fails this test.

3) Injector leakage: With the fuel system pressurized, check the tip of each injector for leakage. No fuel should leak out. Clean or replace the injector if it leaks more than specified.

iv) IAC motor (General Motors)

The idle air control motor regulates the idle speed of engine. This is controlled by the engine's computer.

- 1) See if the "check engine" light is on.
- 2) Disconnect IAC valve and turn on your car. At this point idle speed should rise like it's supposed to.
- 3) Turn off car and reconnect your IAC. Restart the car and idle speed should go back to normal. If it does, this MIGHT rule out the IAC but further testing is necessary. Try obtaining one from a junk yard if the cost of a new one is prohibited and see if that makes any difference.
- 4) Use a test light if the idle speed did not do what it was supposed to. Hook it up to the idle air control solenoid and watch the light. The light will either flash or become dimmer for the four circuits if the valve is at fault. If it doesn't, it means the wiring or the computer (power train control module) is bad.

- c) Write the causes for
- i) Excessive oil consumption.
 - ii) low oil pressure
 - iii) external oil leakage
 - iv) poor oil viscosity

Answer: **Causes for-**

i) Excessive oil consumption (Any four)

- 1) Loose main or connecting rod bearings.
- 2) Tapered or out of round cylinders.
- 3) Worn out piston rings, piston or scored liner.
- 4) Worn oil seals (front and rear main bearings).



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<p>5) Clogged oil return pipe. 6) Worn out rear camshaft oil seals. 7) Clogged air breather. 8) Leaky fuel pump vacuum booster. 9) Excessive clearance in intake valve guide. 10) Improperly installed oil pan.</p> <p>ii) Low oil pressure</p> <p>1) Less oil in crank case. 2) Use of low viscosity oil or diluted oil in sump. 3) Low grade of oil or poor quality of oil. 4) Worn out main and big end bearing. 5) Leaky filter, oil pipe or oil pump. 6) Bypass valve spring defective. 7) Maladjustment of regulating valve spring. 8) Defective oil pressure gauge. 9) Too much play in oil pump gears. 10) Choked suction strainer of oil pump. 11) Choked oil gallery or suction pipe.</p> <p>iii) External oil leakage.</p> <p>1) Improperly installed oil pan. 2) Cracked or defective oil pan. 3) Loose or defective drain bolt. 4) Defective gasket. 5) Excessive oil in oil pan.</p> <p>iv) Poor oil viscosity.</p> <p>1) Unspecified oil. 2) Two or more brand's of oil (cocktail of oil) 3) Oil is not changed as per schedule of maintenance. 4) Engine operates at high temperature. 5) Coolant is mixed with oil.</p>	<p>2</p> <p>2</p> <p>2</p>
<p>5. Attempt any FOUR :</p>	<p>16</p>
<p>a) Write the procedure to service the carburetor.</p>	<p>4</p>
<p>Answer: Procedure to service the carburetor.</p> <p>1) Dismantle of carburetor to completely wash it with clean petrol. 2) Check each circuit blowing compressed air in each to ensure these are absolutely clean. 3) Check all the jets by blowing air by mouth to see they are not blocked. 4) While fitting if fiber washers are placed under the jet seat always use a new fiber washer. 5) Always use a new gasket while assembling carburetor. 6) While overhauling engine use major overhaul kit for overhauling it. 7) Never clean jets or petrol passage in carburetor body with steel wire it may injure the passage only use compressed air for cleaning. 8) Check float ball for any leakage for checking this hold the float ball in hot water for some time, see if bubbles are coming –if it is leaking never try to repair it change it with a new one. 9) Adjust float ball lift as per the manufactures recommendations.</p>	<p>4</p>



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- 10) Check the throttle valve its shafts and bushes for wear if worn out get them repaired.
11) If a new throttle valve disc has been replaced punch the holding screw so that it is locked and there is no change of its getting loose.
12) After assembling the carburetor never test it with compressed air it may offsets float ball setting or may puncture it.

b) Write any one trouble, its cause and its remedy of clutch in a car.

Answer: **Trouble, causes and remedies of clutch in a car:** (Any one trouble, with any four suitable causes and their remedies - 1 mark each.)

1. Trouble: Clutch slip

Sr.	Causes	Remedies
	Oil or grease on the driven plate facings	Fit new plate and eliminate oil leak
2	Binding of clutch pedal mechanism/ Incorrect pedal adjustment.	Make Free and lubricate joints./ Adjust the pedal.
3.	Weak pressure springs.	Replace with new springs.
4.	Incorrect setting of release levers.	Reset the lever properly.
5.	Improper clutch free play.	Adjust properly.

2. Trouble: Clutch Drag

Sr.	Causes	Remedies
	Oil or grease on the driven plate facings	Fit new plate and eliminate oil leak
2	Binding of clutch pedal mechanism/ Incorrect pedal adjustment.	Make Free and lubricate joints./ Adjust the pedal.
3.	Weak pressure springs.	Replace with new springs.
4.	Incorrect setting of release levers.	Reset the lever properly.
5.	Improper clutch free play.	Adjust properly.

3. Trouble :Clutch Noise

Sr.	Causes	Remedies
1	Worn out clutch components	Repair/Replace with new one.
2	Excessive free play	Adjust properly.
3.	Weak/Broken pressure spring	Replace
4.	Insufficient clutch pedal travel adjustment	Adjust the clutch pedal
5.	Bent friction/pressure plate	Replace

c) If any two or three teeth are broken on first gear of counter shaft and also there is oil leakage above counter shaft of the gearbox, which parts will be required to replace?

Answer: If any two or three teeth are broken on first gear of counter shaft and also there is oil leakage above counter shaft of the gearbox, then following parts will be required to replace:

- 1) Worn out engine shaft.
- 2) Torn oil seals of engine shaft.
- 3) First gear of counter shaft.
- 4) Worn out bearing of counter shaft or main shaft.
- 5) Leaky gear box housing.
- 6) If excessive oil in gear box, then top up oil up to correct level.
- 7) Damaged shifting sleeve.

d) Write the procedure to check and adjust ring gear run - out in differential.

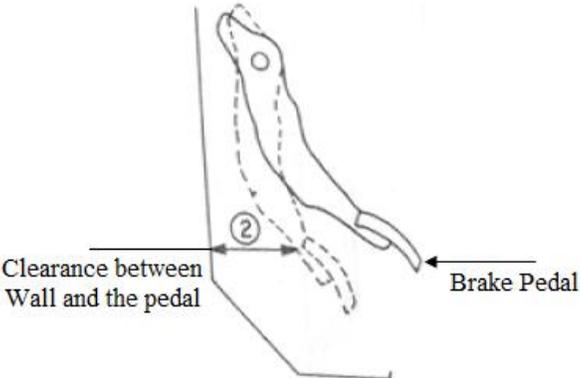
Answer: **Procedure to check and adjust ring gear run - out in differential.**

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<p>Brake Drum :</p> <ol style="list-style-type: none"> 1. Inspect brake drum for defects and wear these are scored drum, barrel shaped drum, bell mouthed drum. 2. Check brake drum diameter <p>Brake lining:</p> <ol style="list-style-type: none"> 1. Inspect brake lining for glazed surface. 2. Check thickness of brake lining. 3. Check margin for relining. 4. Check rivets head position. 	<p>1</p> <p>1</p>
<p>6. Attempt any TWO:</p>	<p>16</p>
<p>a) Write the meaning of shoe clearance, brake pedal free travel, pedal to wall clearance, parking brake adjustment.</p>	<p>8</p>
<p>Answer :The meaning of -</p> <p>Shoe clearance- It means clearance between brake shoe lining and brake drum. After considerable use of the brakes, the brake lining and drum gets worn out. Due to which the brake shoe cannot exert sufficient pressure and brake starts slipping. So it is required to adjust the clearance with the help of brake adjuster.</p> <p>Brake pedal free travel – It means the distance through which the brake pedal travels before resistance is felt. It is kept approximately 3 to 6 mm which is required to take up the clearance between the piston of master cylinder and the piston rod when in released position.</p> <p>Pedal to wall clearance- It is the clearance between floor board and brake pedal. For proper application of brakes it is important that brake pedal should not touch the floor board when fully depressed. It is approximately 45 to 50 mm.</p>	<p>2</p> <p>1</p> <p>1</p>
<div style="text-align: center;">  </div>	
<p style="text-align: center;">Figure: Pedal to Wall Clearance</p>	
<p>Parking brake adjustment:</p> <ol style="list-style-type: none"> 1. Pull the parking brake lever by one hand and see that the rear wheels are completely braked and note the notches travelled by hand lever. 2. In case the lever moves more than 3 notches, rear brake shoe requires adjustment. 3. In case after adjusting brake shoe and drum clearance of the parking brake lever still moves by 3 notches and wheels are not braked then adjust the parking brake cable through adjusting nut A as shown in figure. 	<p>4</p>

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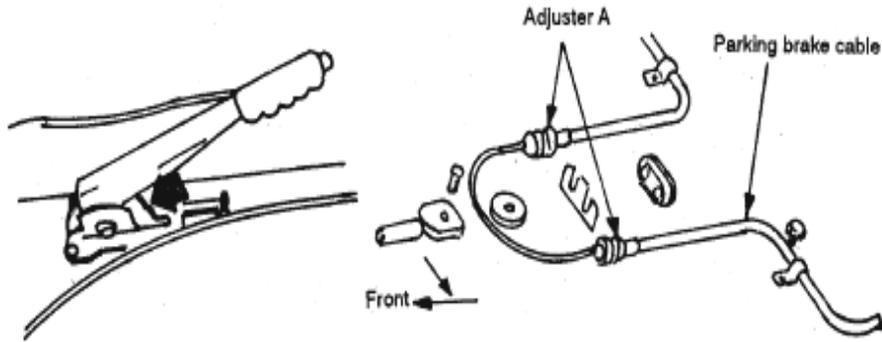


Figure: Parking Brake adjustment in maruti car.

b) Write the procedure to check cracks, loose rivets & skewness and also to repair above problems in the frame of a HMV.

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Answer: **Procedure to Check cracks, Loose rivets & skewness and repair of frame.**

A) Cracks: Cracks can be detected by inspecting the chassis carefully. If it is not visible, wash the chassis first, then coat the surface with a solution of chalk and water. When it becomes dry, tap the area with a hammer then the crack will be visible.

In case, the crack is observed, it should be immediately repaired. In case the repair facilities do not exist, then drill 5 to 6 mm diameter hole at the end of cracks as shown in figure. This drilling of hole will stop further expansion of crack. The holes work like the first aid for the crack.

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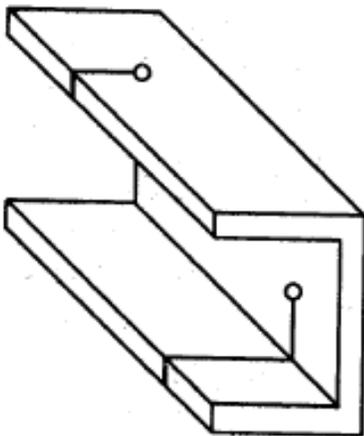


Fig. Drilling hole at the end of crack

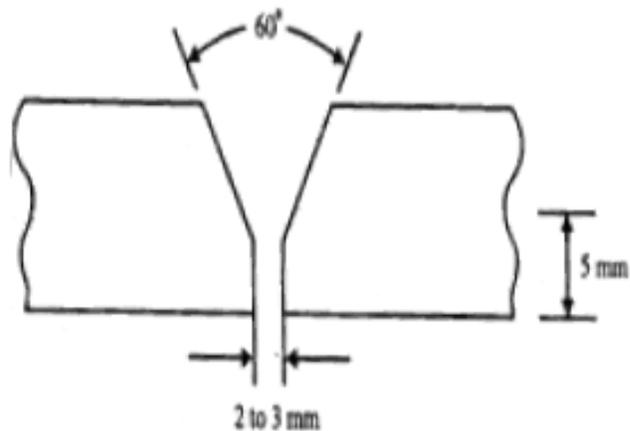


Figure. Making 'V' groove for welding

To repair cracks following procedure is adopted :

1. For welding the chassis make a groove of 2 to 3 mm in the crack at bottom portion and chamfer the upper end of the groove to make a V shape. Weld a groove with at least 3 layers. After welding, it is cooled down, then grid the surface to make it smooth.
2. Considering second case. If crack is more than $\frac{1}{2}$ of chassis cross-section, it will be necessary to reinforce the area, by placing a steel plate and chassis thickness. While welding the plate, never weld it fully on all sides.

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B) Loose Rivets: Check for loose rivets especially in the vehicle which are being overloaded or run on bad road. The loose rivets can easily be detected by presence of the rust or bur around the rivets by visual inspection and then tapping it with a hammer. If found loose, it should be removed and a new rivet should be placed immediately.

For replacement of rivets following procedure is adopted:

1. Cut the rivet head with drill or welding torch; do not use a chisel as it will damage the rivet hole. In case the hole is already damaged, drill a bigger hole and use bigger diameter rivet.
2. The diameter of new rivets should be 1 mm less than the hole diameter.
3. Clean the hole thoroughly, there should be no bur.
4. Heat the rivet, when hot, fix it in the hole and rivet its head.
5. Never fix up a cold rivet, as it will not make a good joint.
6. Do not weld rivet with chassis. If it is loose, remove and fix a new one.

C) Procedure for checking skewness (Misalignment and repair):

- a) Place the vehicle on plane leveled ground.
- b) Mark the markings on the floor from all the points from which measurements should be taken by dropping the plumb bob directly underneath the point.
- c) Move the vehicle away from the layout on floor.
- d) Check frame width at front and rear end. If width is corresponds to specification, draw a centre line up to full length of the vehicle half way between marks indicating front and rear width. If frame width is not correct draw centre line through intersections of any two pairs of equal diagonals.
- e) With the centre line properly laid out, measure the distance from it to points opposite over the entire length of chassis. If frame is in proper alignment measurement should not be vary.
- f) To locate the points at which the frame is sprung measure the diagonals marked in pairs A-B, B-C, C-D. If the diagonals in each pair are within 3.17mm, that part of the frame between the points of measurements is considered as in satisfactory alignment. These diagonals should intersect at centre line.

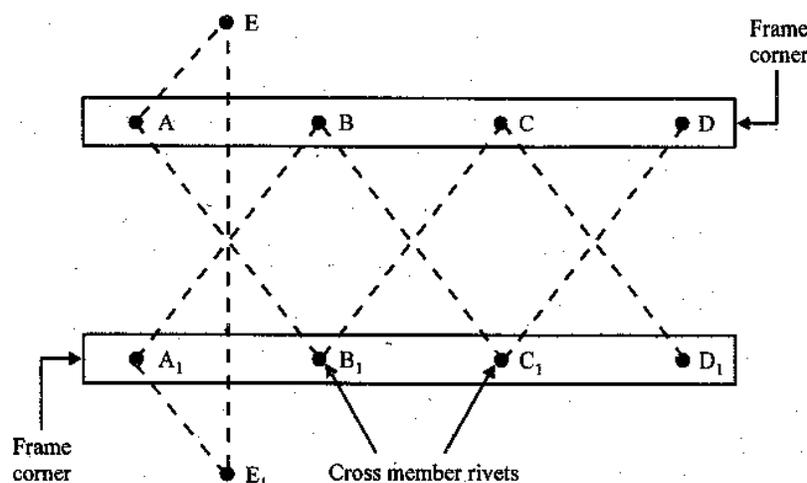


Figure: Checking alignment of frame.

Repair of Skewness of frame:

Skewed frame can be repaired with two jack, dolly block, special type of bending tools and localized heating of the particular chassis bend. After repairing of frame check alignment of chassis accurately.



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c) List the tools and equipments required in denting and painting of car body. Also write procedure for painting of a car. 8

Answer: Tools and equipment used for denting:

1. Hammer
2. Dolly blocks
3. Spoons
4. Files
5. Soldering equipment, blow lamp, Acetylene torch, Brazing torch .
6. Electric and gas welding equipment
7. Buffing and polishing machines.
8. Pick Tools – Picking bars, Hook bar, small pick tools, Pull rods
9. Drilling Machine
10. Hydraulic Ram

2

Tools and Equipment used for painting

1. Spray Booth
2. Air Compressor
3. Automatic pressure Switch
4. Air-transformer
5. Hoses
6. Hose Connections
7. Blow guns
8. Respirators
9. Infrared backing element.

2

Procedure for painting of a car

- 1) Find a suitable place for painting with excellent ventilation, minimal dust, good lighting, electricity, and room to work around the vehicle.
- 2) Gather the materials and equipment which are essential for painting of car like-Paint, Sanding and polishing tools and supplies, Safety equipment.
- 3) Remove rust from surface to be painted and repair dents.
- 4) Remove any chrome or plastic trim.
- 5) Sand the paint either to the bare metal, the original primer, or at least sufficiently for the new paint to adhere to. Clean all surfaces thoroughly; using mineral spirits or denatured alcohol to make sure no oils (including body oils from fingers and hands) are on the car.
- 6) Use masking tape and paper to cover all surfaces not to be painted, including glass, window trim, door handles, mirrors, and grills. Make sure that there are no holes in the masking tape and paper that will allow overspray to get through.
- 7) Prime the surface with a corrosion resistant, self-etching primer if you have removed all paint down to bare metal
- 8) Allow the primer to cure thoroughly. Check the information on the container
- 9) Sand all primed surfaces smooth.
- 10) Clean the surface after priming to remove any dust or oil that has accumulated during priming. Wipe it using a wax and grease remover or acetone.
- 11) Spray the finish paint on the car. Prepare the paint for spraying according to manufacturer's directions.
- 12) Allow the paint to fully cure.
- 13) Finish sanding the car. Rinse any sanding residue from the surface and allow it to dry.
- 14) Use a rubbing compound to polish the paint and begin to bring out a gloss

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