Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 3rd Semester,

2nd In-Sem. Examination

Course Code: AUT1301 **Time: 1 Hour**

Course Name: Automotive Power Train **Max. Marks: 20**

Instruction: Attempt all questions.

Section A: Select the one correct option from the given options in the following questions.

Section – A

05X01 = 05 Marks

Q-1. What does the W in 5W-30 motor oil stands for?

a. Weight
c. Winter
b. Wear
d. Won

Q-2. Viscosity is measure of how easily a .....

a. Liquid flow
c. Acid build up
b. Cool the engine
d. Cleaning agent work

Q-3. In an automobile engine the temperature of the piston will be more at.....

a. The Skirt of the piston
c. The Piston walls
b. The Crown of the piston
d. The piston rings

Q-4. The essential components of battery ignition system are:

a. Battery
c. Ignition switch
b. Ballast resistor
d. All of the mentioned

Q-5. If the intake air temperature of I.C. engine increases, its efficiency will:

a. Increase
c. Remain same
b. Decrease
d. Unpredicatable

Section – B

03X02 = 06 Marks

Q-6. What is carburetor and why it is replaced by MPFI system?

Q-7. Write the difference between mechanical injection and electronic injection system.

Q-8. Write short notes on:

A) Exhaust Gas Recirculation Valve

B) Exhaust Valves

Section – C

03X03 = 09 Marks

Q-9. Explain fuel supply system for diesel engine.

Q-10. Explain gasoline fuel supply system components.

Q-11. Explain fuel efficiency test procedure.

Answer Sheet

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 3rd Semester,

2nd In-Sem. Examination

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Section – B

03X02 = 06 Marks

Q-6. What is carburetor and why it is replaced by MPFI system?

Ans:

A carburetor or carburetor is a device that mixes air and fuel for internal combustion engines in the proper air–fuel ratio for combustion.

In carbureted engines, the fuel/air mixture meets in the carburetor. In the fuel injected engine, the fuel and air do not mix until they reach the cylinder. Since fuel injection systems shoot fuel directly into the cylinders, they are easier to flood (too much fuel) when starting.

Q-7. Write the difference between mechanical injection and electronic injection system.

Ans:

Electronic injection system:

Electrical fuel pumps draws fuel through filter & supplies to injector at a pressure which held constant by means of a fuel pressure regulator. Excess fuel is returned to tank by fuel pressure regulator. Vapour lock is prevented in fuel lines

Mechanical injection system:

Fuel pressure pump, pumps the fuel at a specified pressure (about 700 kpa). Quantity of fuel delivered is controlled in the distributor by the engine manifold pressure. Fuel pressure open the injector to deliver atomised spray of fuel.

Q-8. Write short notes on

A) Exhaust Gas Recirculation Valve

Ans:

In internal combustion engines, exhaust gas recirculation (EGR) is a nitrogen oxide (NO. x) emissions reduction technique used in petrol/gasoline and diesel engines. EGR works by recirculating a portion of an engine's exhaust gas back to the engine cylinders.

B) Exhaust Valves:

Ans:

An exhaust valve is a valve that releases burned gases from a cylinder. The exhaust valve closes during the initial part of the induction stroke. The inlet valve usually opens a little before top dead center and the exhaust valve remains open a little after top dead center.

Section – C

03X03 = 09 Marks

Q-9. Explain fuel supply system for diesel engine.

ANS: **DIESEL FUEL SYSTEM BASICS**

INTRODUCTION

The function of the diesel fuel system is to inject a precise amount of atomized and pressurized fuel into each engine cylinder at the proper time. Combustion in a diesel engine occurs when this rush of fuel is mixed with hot compressed air. (No electrical spark is used as in a gasoline engine.)

The fuel system consists of the following components.

FUEL TANKS

There are many different types and shapes of fuel tanks. Each size and shape is designed for a specific purpose. The fuel tank must be capable of storing enough fuel to operate the engine for a reasonable length of time. The tank must be closed to prevent contamination by foreign objects. It must also be vented to allow air to enter, replacing any fuel demanded by the engine. Three other tank openings are required--one to fill, one to discharge, and one to drain.

FUEL LINES

There are three types of diesel fuel lines. These include heavyweight lines for the high pressures found between the injection pump and the injectors, medium weight lines for the

light or medium fuel pressures found between the fuel tank and injection pump, and lightweight lines where there is little or no pressure.

FUEL FILTERS

Diesel fuel must be filtered not once, but several times in most systems. A typical system might have three stages of progressive filters--a filter screen at the tank or transfer pump, a primary fuel filter, and a secondary fuel filter. In series filters, all the fuel goes through one filter and then through the other. In parallel filters, part of the fuel goes through each filter.

For more information on fuel filters, see Diesel Fuel Filter Basics.

FUEL TRANSFER PUMPS

Simple fuel systems use gravity or air pressure to get fuel from the tank to the injection pump. On modern high speed diesel engines, a fuel transfer pump is normally used. This pump, driven by the engine, supplies fuel automatically to the diesel injection system. The pump often has a hand primer lever for bleeding air from the system. Modern injection pumps are almost all jerk pumps which use the plunger and cam method of fuel injection.

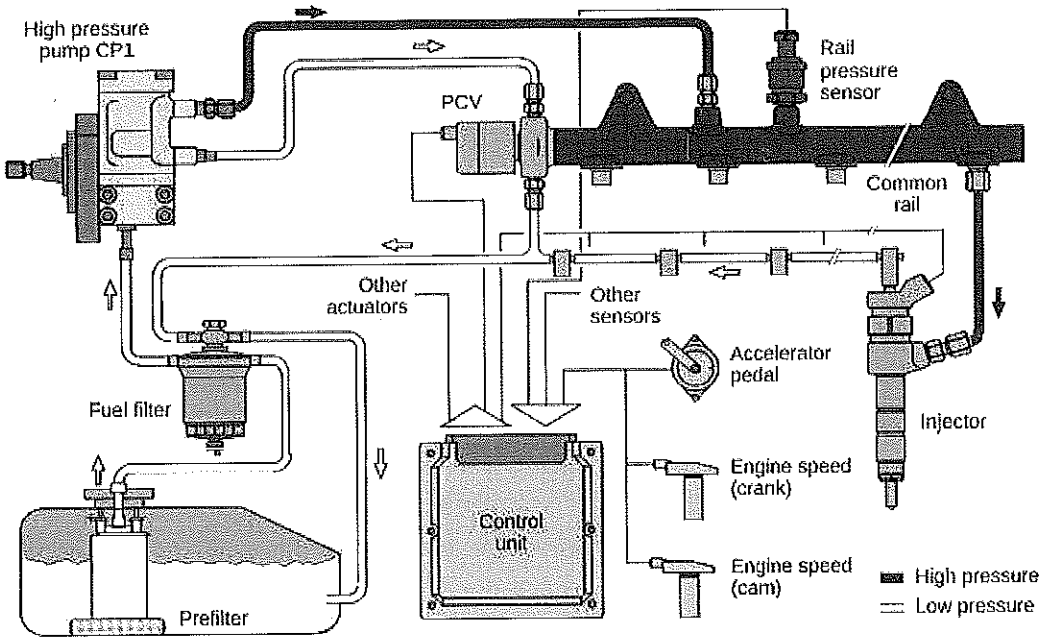
FUEL INJECTION SYSTEMS

There are four primary systems for injecting fuel:

1. Individual pump and injector for each cylinder
2. Combined pump and injector for each cylinder (*unit injector type*)
3. One pump serving injectors for several cylinders (*distributor type*)
4. Pumps in a common housing with injectors for each cylinder (*common rail system*)

The common rail system is rapidly gaining popularity for on-road applications. The in-line and distributor types are used on off-road vehicles and industrial machines.

High Pressure Common Rail Fuel System Diagram



FUEL INJECTORS

Diesel fuel injectors are arguably the most important fuel system component. The job of the injectors is to deliver a precise amount of atomized and pressurized fuel into each cylinder. Highly atomized, pressurized fuel distributed evenly throughout the cylinder results in increased power and fuel economy, decreased engine noise, and smoother operation.

Modern diesel fuel injectors, such as those found in common rail fuel systems, use piezoelectricity. Piezoelectric injectors are extremely precise and can handle the very high pressures found in common rail applications.

DIESEL FUEL

The fuel used in modern high speed diesel engines is derived from the heavier residues of crude oil that are left over after the more volatile fuels such as gasoline are removed during the refining process. The most common grade of diesel fuel is 2-D, more commonly known as ultra low sulfur diesel (ULSD).

For more information on diesel fuel, see Ultra Low Sulfur Diesel Basics.

WATER

A common enemy of diesel fuel systems is water. Unfortunately, water is more common in diesel fuel than most people realize. Should water find its way into an injection system, it will rapidly oxidize ferrous metal (steel) components. Some of the most common failures attributed to water include:

- Injection component seizure
- Sticky metering components in both the pump and injector
- Governor/metering component failure

CONCLUSION

A diesel fuel system is a critical component of any diesel engine and its optimum operation is essential for peak performance. E-ZOIL manufactures several additives formulated to address common issues encountered by the diesel fuel system. DIESEL AID, DIESEL AID + CETANE, ARTIC POWER, ARTIC FLO and CLEAN & LUBE increase fuel system lubricity preventing premature failure of fuel pumps and injectors. Additionally, DIESEL AID and DIESEL AID + CETANE totally disperse water, which also causes premature failure of fuel system components.

Q-10. Explain gasoline fuel supply system components.

Ans:

Air meter: - A mass (air) flow sensor (MAF) is a sensor used to determine the mass flow rate of air entering a fuel-injected internal combustion engine.

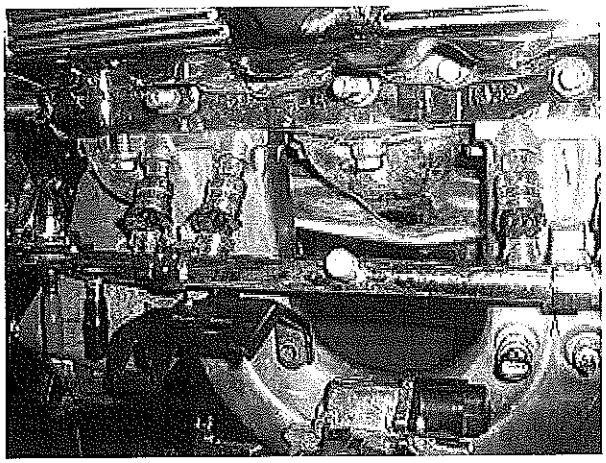
The air mass information is necessary for the engine control unit (ECU) to balance and deliver the correct fuel mass to the engine. Air changes its density with temperature and pressure. In automotive applications, air density varies with the ambient temperature, altitude and the use of forced induction, which means that mass flow sensors are more appropriate than volumetric flow sensors for determining the quantity of intake air in each cylinder.

There are two common types of mass airflow sensors in use on automotive engines. These are the vane meter and the hot wire. Neither design employs technology that measures air mass directly. However, with additional sensors and inputs, an engine's ECU can determine the mass flow rate of intake air.

Both approaches are used almost exclusively on electronic fuel injection (EFI) engines. Both sensor designs output a 0.0–5.0 volt or a pulse-width modulation (PWM) signal that is proportional to the air mass flow rate, and both sensors have an intake air temperature (IAT) sensor incorporated into their housings for most post on-board diagnostics (OBDII) vehicles. Vehicles prior to 1996 could have MAF without an IAT.

When a MAF sensor is used in conjunction with an oxygen sensor, the engine's air/fuel ratio can be controlled very accurately. The MAF sensor provides the open-loop controller predicted air flow information (the measured air flow) to the ECU, and the oxygen sensor provides closed-loop feedback in order to make minor corrections to the predicted air mass. Also see manifold absolute pressure sensor (MAP sensor).

Throttle body:



Fuel rail connected to the injectors that are mounted just above the intake manifold on a four-cylinder engine.

Fuel injection is the introduction of fuel in an internal combustion engine, most commonly automotive engines, by the means of an injector.

All diesel engines use fuel injection by design. Petrol engines can use gasoline direct injection, where the fuel is directly delivered into the combustion chamber, or indirect injection where the fuel is mixed with air before the intake stroke.

On petrol engines, fuel injection replaced carburetors from the 1980s onward. The primary difference between carburetion and fuel injection is that fuel injection atomizes the fuel through a small nozzle under high pressure, while a carburetor relies on suction created by intake air accelerated through a Venturi tube to draw the fuel into the airstream.

- **Sensors:** Engine Sensors: In order to provide the correct amount of fuel for every operating condition, the engine control unit (ECU) has to monitor a huge number of input sensors. Here are just a few:

- **Mass airflow sensor** - Tells the ECU the mass of air entering the engine
- **Oxygen sensor(s)** - Monitors the amount of oxygen in the exhaust so the ECU can determine how rich or lean the fuel mixture is and make adjustments accordingly
- **Throttle position sensor** - Monitors the throttle valve position (which determines how much air goes into the engine) so the ECU can respond quickly to changes, increasing or decreasing the fuel rate as necessary
- **Coolant temperature sensor** - Allows the ECU to determine when the engine has reached its proper operating temperature
- **Voltage sensor** - Monitors the system voltage in the car so the ECU can raise the idle speed if voltage is dropping (which would indicate a high electrical load)
- **Manifold absolute pressure sensor** - Monitors the pressure of the air in the intake manifold

- The amount of air being drawn into the engine is a good indication of how much power it is producing; and the more air that goes into the engine, the lower the manifold pressure, so this reading is used to gauge how much power is being produced.
- **Engine speed sensor** - Monitors engine speed, which is one of the factors used to calculate the pulse width

There are two main types of control for **multi-port** systems: The fuel injectors can all open at the same time, or each one can open just before the intake valve for its cylinder opens (this is called **sequential multi-port fuel injection**).

The advantage of sequential fuel injection is that if the driver makes a sudden change, the system can respond more quickly because from the time the change is made, it only has to wait only until the next intake valve opens, instead of for the next complete revolution of the engine.

Fuel rail: The main function of the fuel rail consists in the optimal distribution of the fuel (gasoline, methane, etc.) to the injectors in the high or low pressure supply systems of endothermic engines.

It consists of a duly sized piping that fits the injector housings, the fixing brackets to the air intake manifold or to the motor cylinders head, connections for fuel inlet and, if necessary, fuel recirculation in the tank, the housings for the fuel temperature and pressure sensors, the housing for an internal discharge control valve, if necessary, and the supports for the electrical wirings of the assembled electromechanical components.

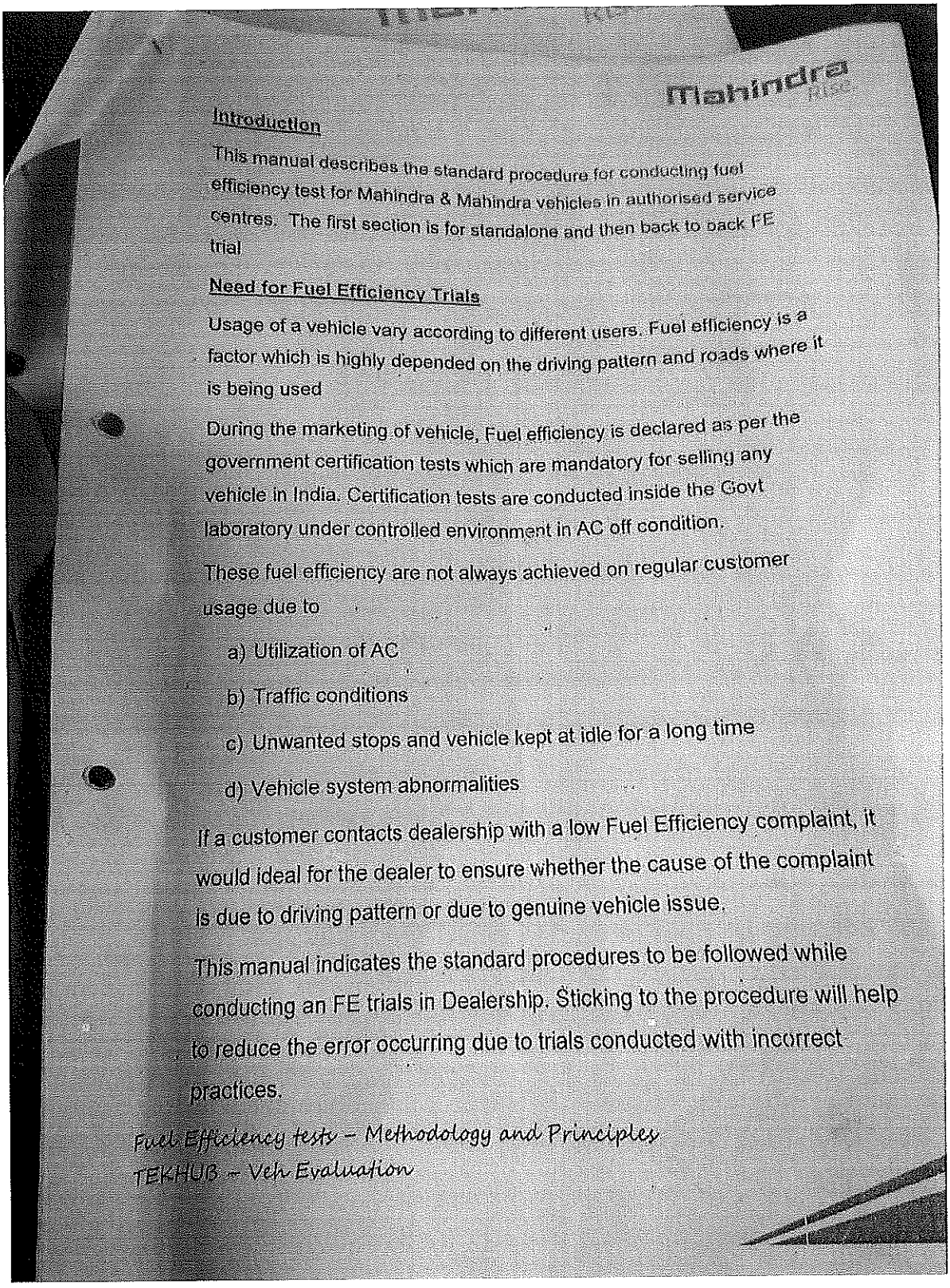
Gasoline fuel rail

The fuel rail for gasoline engines can be made in thermoplastic material with high mechanical, thermal or chemical resistance or in steel.

The operating pressure is obtained and maintained through a pressure regulator that can be incorporated into the rail (systems equipped with fuel recirculation) or in the fuel pump (systems without recirculation). Rail design is based on instantaneous flow rate control requirements

Q-11. Explain fuel efficiency test procedure.

ANS:



Mahindra

Introduction

This manual describes the standard procedure for conducting fuel efficiency test for Mahindra & Mahindra vehicles in authorised service centres. The first section is for standalone and then back to back FE trial

Need for Fuel Efficiency Trials

Usage of a vehicle vary according to different users. Fuel efficiency is a factor which is highly depended on the driving pattern and roads where it is being used

During the marketing of vehicle, Fuel efficiency is declared as per the government certification tests which are mandatory for selling any vehicle in India. Certification tests are conducted inside the Govt laboratory under controlled environment in AC off condition.

These fuel efficiency are not always achieved on regular customer usage due to

a) Utilization of AC

b) Traffic conditions

c) Unwanted stops and vehicle kept at idle for a long time

d) Vehicle system abnormalities

If a customer contacts dealership with a low Fuel Efficiency complaint, it would ideal for the dealer to ensure whether the cause of the complaint is due to driving pattern or due to genuine vehicle issue.

This manual indicates the standard procedures to be followed while conducting an FE trials in Dealership. Sticking to the procedure will help to reduce the error occurring due to trials conducted with incorrect practices.

Fuel Efficiency tests - Methodology and Principles
TEKHUB - Veh Evaluation

Mahindra Rise

Procedure for FE trials

Preliminary activities

- Understand the customer complaint thoroughly and note down the Fuel efficiency values specified by the customers
- Confirm whether the customer has measured the Fuel efficiency by tank full to tank full method or by using the AFE from infotainment system or any other techniques if any.
- Collect the details regarding the Fuel filling station where the customer is doing fuel filling for conducting FE trials.
- Make sure the vehicle has undergone all the periodic maintenance as per the service schedule.
- Inspect the vehicle for

  A) Abnormal noise / vibrations

  B) Air leakage from intake

  C) Abnormal smoke (Black, white or Blue)

  D) Wheel freeness – (Brake grabbing and wheel bearing freeness)

  E) AC performance if trial is to be done with AC – (Filter conditions, clean if necessary. AC cooling, whether it's as per normal vehicle etc.)

- Make sure that the vehicle is having tyres in good condition. Ensure that the air pressure is maintained as per the specs. The tyre pressure has to be checked in cold. If in doubt- start the trial in morning after checking the tyre pressure in cold.

Fuel Efficiency tests – Methodology and Principles
TEKHUB – Veh Evaluation

- Please arrange to remove any punctures if any. Reduced air pressure on tyres can increase the fuel consumption considerably.
- Ensure that the vehicle is equipped with correct EMS dataset.

FE trials

1. Allow the vehicle to cool down for an hour or more before fuel filling (If possible)
2. After preliminary checkup, take the vehicle to the Fuel filling station and fill the fuel upto the tip of filler neck.
3. Once the fuel has reached upto to the tip, close the filler cap and shake the vehicle side wise for 2 – 3 times. This will allow the air entrapped inside the fuel tank to come out and the fuel level to reduce and go inside the tank
4. Repeat step 3, two times and observe whether the fuel level is reducing each time after shaking the vehicle.
5. If the fuel is not reducing even after shaking, close the filler cap properly and then go to step 6, otherwise repeat step 3.
6. Note down the odometer reading & reset the trip meter to zero.
7. Once the data is collected, start driving the vehicle normally through the customer specified route through the FE trial driver

FE trial Driver

a) Make sure the driver has a valid driving license.

b) Driver should be well versed in driving the said model. Driver should not have the habit of clutch riding. He should not be driving with left leg resting on top of the clutch. (tip : In our latest vehicles which are having gear display, if the clutch is pressed then it will show – instead of gear)

Fuel Efficiency tests – Methodology and Principles

Mahindra
Rise.

c) Driver should drive the vehicle like a normal customer. Unnecessary braking, engine revving and gear shifting should be avoided.

8. It is critical to conduct trials for at least 150 Km or above for fuel efficiency trials.

9. Conducting trials for lesser kilometer's will increase the chances of having error while calculating fuel efficiency in tank full to tank full method. Once the trials are completed, follow steps 1, 3, 4, 5, 6.

10. The speeds should be controlled within 80 to 100. Take care to avoid sudden acceleration and last minute braking (use of engine as brake recommended)

11. Use appropriate gear shift points to avoid engine revving or engine lugging by staying in the optimum Engine RPM and torque band.

12. AC should be in Recirculation mode; Blower speed : 2; Maximum cooling.

Loading:

For passenger: D +3

For commercial: test under GVW or no load conditions. If superstructure already built then it should be up to GVW.

Fuel Efficiency tests – Methodology and Principles
TEKHUB – Veh Evaluation

Mahindra
Rise

Back to Back trials

Back to Back Fuel Efficiency trials are conducted when the Fuel efficiency of one vehicle has to be compared with another vehicle.

In back to back trials, both the vehicles has to be driven in same route on similar speeds. It is compulsory that the fuel is filled at the same fuel station to obtain accurate results.

Fuel filling and driving patterns as defined in the FE trial section to be followed.

Some other factors to be considered specifically for Back to Back trials are:

A. It is recommended to use vehicles which have similar odometer readings for better comparison.
B. Avoid aggressive driving and racing during trials
C. It is recommended to keep a distance of around 100 m in city and 500 m in highway to reduce the effect of following too closely and also to avoid the benefit of less air drag for 2nd vehicle.
D. Maintain a constant gap between vehicles and match the speed of the leading vehicle.
E. Interchange drivers (at half point if there is 2 vehicles) to evenly spread the driving effect on each vehicle
F. It is advisable to do the oil change on both the vehicle (if possible) before doing the trial. This can rule out the variations.

Fuel Efficiency tests – Methodology and Principles
TEKHUB – Veh Evaluation

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 3rd Semester

2nd In-Sem. Examination

Course Code: AUT1302 **Time: 1 Hour**

Course Name: Automotive Braking, Suspension & Steering System **Max. Marks: 20**

Instruction:

1. **Attempt all questions from section A, each question carries one mark.**
2. **Attempt all questions from section B, each question carries two mark.**
3. **Attempt all questions from section C each question carries three mark**

Section – A

Directions: Select any one correct answer from the given options: **05X01 = 05 Marks**

Q.1 Which parts of an automobile is first suspension for the vehicle?

a) Leaves of leaf spring
b) Coil Spring
c) Tires
d) None of the above

Q.2 The shock absorber is also known as damper because they:

a) Absorb the sound of springs
b) Absorb the vibrations of springs
c) Absorb the heat of springs
d) All of the above

Q.3 Which type of suspension system allows one wheel to move up and down with minimum effect to the other?

a) Independent
b) Rigid
c) Flexible
d) None of the above

Q.4 If a person turns the steering wheel 150 degrees then how much should the wheel turns while having a steering ratio of 15:1?

a) 26 degrees
b) 150 degrees
c) 15 degrees
d) None of the above

Q.5 Which material is used to manufacture springs used in suspension system?

a) Mild Steel

b) Spring Steel

c) Stainless Steel

d) High Carbon Steel

Section – B

03X02 = 06 Marks

Q.6 What do you understand by Spring Rate in case of coil springs? Also write down the formula of spring rate.

Q.7 What are the functions of a suspension system in an automobile?

Q.8 Write down the procedure for Wheel balancing?

Section – C

03X03 = 09 Marks

Q.9. Explain the construction and working of a Leaf Spring with the help of a neat sketch.

Q.10 Explain the methods for diagnosis/testing of a suspension system to identify the related problems.

Q.11 Write a short note on:

a. Macpherson Strut Suspension

b. Steering ratio

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 3rd Semester

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Section – A

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Section – B

03X02 = 06 Marks

Q.6 What do you understand by Spring Rate in case of coil springs? Also write down the formula of spring rate.

- Ans, The spring rate (K) for coil springs is expressed by the formula:

$$K = \frac{Gd4}{8ND3}$$

- Where , G 11,250,000 (constant for steel), d diameter of wire , N number of coils D diameter of the coil

Types of spring on basis of spring rate

- A **constant-rate spring** compresses at the same rate regardless of the amount of weight that is applied.
- **Variable-rate springs** come in a variety of shapes and compress more slowly as weight is applied.

Q.7 What are the functions of a suspension system in an automobile?

- Ans. The suspension system must provide proper steering control and ride quality. Performing these functions is extremely important to maintain vehicle safety and customer satisfaction.
- The suspension system and frame must also position the wheels and tires properly to provide normal tire life and proper steering control. If the suspension system does not position each wheel and tire properly, wheel alignment angles are incorrect and usually cause excessive tire tread wear.
- When the suspension system positions the wheels and tires properly, the steering should remain in the straight-ahead position if the car is driven straight ahead on a reasonably straight, smooth road surface.

Q.8 Write down the procedure for Wheel balancing?

1. Ans. Complete all the preliminary balance checks mentioned previously in this chapter.

2. Be sure the tire and wheel assembly is mounted on the balancer using the balancer manufacturer's recommended mounting procedure.
3. Use a pair of wheel weight pliers to remove all the old wheel weights from the wheel rim (Figure 4-27).
4. Enter the wheel diameter, width, and off set in the balancer computer.
5. Be sure the safety hood is lowered over the tire and wheel assembly, and activate the balancer control to spin the wheel and tire assembly.

Section – C

03X03 = 09 Marks

Q.9. Explain the construction and working of a Leaf Spring with the help of a neat sketch.

Ans. **LEAF SPRINGS: Leaf springs** are constructed of one or more strips of long, narrow spring steel. These metal strips, called leaves, are assembled with plastic or synthetic rubber insulators between the leaves, allowing for freedom of movement during spring operation.

The ends of the longest spring leaf are rolled or looped to form eyes. Rubber bushings are installed in the eyes of the spring and act as noise and vibration insulators. The leaves are held together by a **centre bolt,** also called a *centring pin.*

Q.10 Explain the methods for diagnosis/testing of a suspension system to identify the related problems.

Ans.

ROAD TEST DIAGNOSIS: If possible, perform a road test of the vehicle with the owner of the vehicle. It is also helpful to have the owner drive the vehicle. While driving, try to determine when and where the noise or problem occurs, such as the following:

1. In cold or warm weather

2. With cold or warm engine/vehicle

3. While turning, left only, right only

- A proper road test for any suspension system problem should include the following:

1. Drive beside parked vehicles
2. Drive into driveways.
3. Drive in reverse while turning
4. Drive over a bumpy road

DRY PARK TEST (SUSPENSION): A **dry park test** can also be used to help locate worn or defective suspension components. The dry park test is performed by having an assistant move the steering wheel side to side while feeling and observing for any free play in the

1. Front wheel bearings
2. Control arm bushing wear or movement.
3. Ball joint movement.

NOTE: The dry park test (and many other chassis system tests) relies on the experience of the technician to be able to judge normal wear from abnormal wear. It is extremely important that all beginning technicians work closely with an experienced technician to gain this knowledge.

Q.11 Write a short note on:

a. Macpherson Strut Suspension

b. Steering ratio

Ans. a. Macpherson Strut Suspension

- MacPherson Sturt: The **MacPherson strut** is a type of automotive **suspension** system that uses the top of a telescopic damper as the upper steering pivot. It is widely used in the front **suspension** of modern vehicles and is named for American automotive engineer Earle S. **MacPherson**, who originally invented and developed the design. A MacPherson strut includes the suspension spring that transfers the weight of the body to the wheel. A MacPherson strut is the main, load-carrying suspension spring.

- A MacPherson strut typically incorporates an upper and a lower spring seat, a shock absorber mount and dust cap, a dust cover for the piston rod, and a bump stop

- B. To calculate the steering ratio, divide the lock-to-lock steering wheel rotation in degrees by the total front wheel movement in degrees.

- **For example:**
- If the lock-to-lock steering wheel rotation is 3.5 turns, or 1,260°, and the total front wheel movement is 60°, the steering ratio is 1,260 ÷ 60 = 21:1. As a general rule, large, heavy cars have higher numerical steering ratios than small, lightweight cars.

School of Automotive Skills

3rd Semester, 2nd In-Sem. Examination

B. Voc. Program, Summer Semester (2021-22)

Course Code: AUT1303 **Time: 1 Hour**

Course Name: Automotive Body Works **Max. Marks: 20**

Instruction:

1. Answer all questions from **"Section-A"**, each question carries 01 mark.
2. Answer all questions from **"Section-B"**, each question carries 02 marks.
3. Answer all questions from **"Section-C"**, each question carries 03 marks.

Section – A

05X01 = 05 Marks

Q1. Removing and installing a new panel or body part is called:

a) Major repair
b) Minor Repair
c) Paint selection
d) Panel replacement

Q2. A stamping tool is used for .....the dented panel.

a) Restoring Bodyline
b) Making Holes
c) Pulling out dents
d) Pressing

Q3. ..... remover is essential for cleaning the surface prior to sanding or spraying undercoats or to coats.

a) Wax and grease
b) Putty
c) Body filler
d) Seam sealer

Q4. ..... is the event in which two or more bodies exert forces on each other in about a relatively short time.

a) Denting
b) Bending
c) Clamping
d) Collision

Q5. ..... is an essential tool for the quick removal of paint, primer and old body filler from an area being repaired?

a) Sliding hammers
b) Sander
c) Shears
d) Nibblers

Registration No.: .....

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Section – B

03X02 = 06 Marks

Q6. What are the advantages and disadvantages of chemical stripping?

Q7. Write steps to remove front bumper assembly.

Q8. What is the difference between mallet and hammer?

Section – C

03X03 = 09 Marks

Q9. Discuss the panel beating processes and also mention the differences between dolly-on and dolly-off hammering.

Q10. How to repair rusted Panels?

Q11. How to Replace a Windshield?

Answer key

School of Automotive Skills

3rd Semester, 2nd In-Sem. Examination

B. Voc. Program, Summer Semester (2021-22)

Course Code: AUT1303 **Time: 1 Hour**

Course Name: Automotive Body Works **Max. Marks: 20**

Instruction:

1. Answer all questions from **"Section-A"**, each question carries 01 mark.
2. Answer all questions from **"Section-B"**, each question carries 02 marks.
3. Answer all questions from **"Section-C"**, each question carries 03 marks.

Section – A

05X01 = 05 Marks

Q1. Removing and installing a new panel or body part is called:

a) Major repair
c) Paint selection
b) Minor Repair
d) Panel replacement

Q2. A stamping tool is used for .....the dented panel.

a) Restoring Bodyline
c) Pulling out dents
b) Making Holes
d) Pressing

Q3. ..... remover is essential for cleaning the surface prior to sanding or spraying undercoats or to coats.

a) Wax and grease
c) Body filler
b) Putty
d) Seam sealer

Q4. ..... is the event in which two or more bodies exert forces on each other in about a relatively short time.

a) Denting
c) Clamping
b) Bending
d) Collision

Q5. ..... is an essential tool for the quick removal of paint, primer and old body filler from an area being repaired?

a) Sliding hammers
b) Sander

c) Shears

d) Nibblers

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Section – B

03X02 = 06 Marks

Q6. What are the advantages and disadvantages of chemical stripping?

Ans: -

Advantages

- It is used to remove all types of liquid as well as powder paints, lacquers, enamels & polyurethanes from the metal surface.
- It reduces the cleaning effort.
- It saves time.
- It strips large area like doors, panel, bonnet, etc.
- Capability to strip tough configurations.

Disadvantages

- It couldn't be applicable for plastic materials like front and rear bumper.
- Waste could be hazardous.
- It causes irritation while contact to our skins.
- Slow stripping rate.

Q7. Write steps to remove front bumper assembly.

Ans: -

Step 1- Remove Front Beauty Cover

- Remove plastic push-pins holding the top plastic shroud that rests on top of the front clip and extends around the engine bay, including the weather-stripping used to seal out water.
- Once all pins are removed, peel back the weather stripping to loosen the cover.
- Pins locations shown with arrows in the photo below. Once free, set the cover aside.

Step 2- Remove Plastic fasteners

- Remove the plastic fasteners on the upper portion of the front bumper on each side.
- Use a flathead screw driver or the appropriate removal tool and pry upward.

Step 3 - Remove Upper portion bolts

- Remove the 10mm Bolts on the upper portion of the bumper as pictured.

Step 4 - Remove Clips from Under Bumper

- Remove push pin clips from the bottom side of the bumper which hole the splash shield in place.
- Use a flathead screw driver or the appropriate removal tool and pry away.

Step 5 - Remove Clips from the fender areas

- Use a flathead screw driver or the appropriate removal tool and pry away.

Step 6 - Remove Front Clip

- Pull sides of front bumper outward until retention clips release on driver and passenger side.
- See photo below for arrows showing location of retention clips.
- After each side is successfully released, remove front bumper by pulling forward from the grill area. You will not be fully removing the bumper from the car at this moment.

Step 7 - Remove Fog Light Clips and Head Lamp Washer

Step 8 - Complete Removing the Front Bumper

- Fully remove the front bumper by continuing to pull forward in a slow motion.
- If removing the bumper yourself, its recommended to place a towel/blanket on the ground so that you do not scrape anything if dragged or dropped on the ground.

Q8. What is the difference between mallet and hammer?

Ans: -

A **hammer** is made of hardened steel and has, depending on its purpose, either a claw for prying, or a hatchet type blade generally use for roofing.

A **mallet** is a kind of hammer, often made of rubber or sometimes wood, that is smaller than a maul or beetle, and usually has a relatively large head. The term is descriptive of the overall size and proportions of the tool, and not the materials it may be made of, though most mallets have striking faces that are softer than steel.

Section – C

03X03 = 09 Marks

Q9. Discuss the panel beating processes and also mention the differences between dolly-on and dolly-off hammering.

Ans: -

After an accident, a car's body may be severely damaged and bent out of shape. The dents and breakages need to be beaten and smoothed back to shape. This entire process is referred to as panel beating and is usually carried out by panel beaters using specialized

tools and techniques. A good panel beating should result in a smooth and nearly new appearance without small dents and uneven bumps. Here is a brief description of the processes carried out during panel beating.

Tools Required;

- Dolly & hammer set
- Spoons
- Mallet

The first step to fix a dent would be to stretch the metal back into shape. This is done by heating the dented area with a blow torch and, once well heated, the panel beaters hammer the metal slowly to stretch it back to shape. A shrink hammer is used to beat the metal all while another tool called a dolly is laid back on the panel to give it shape.

Putty may sometimes be used to fill small dents and holes. Panel beaters prepare putty mix and quickly set it into the dents while shaping all through. Putty must be set quickly since it hardens fast. Once applied, the putty filler hardens and the panel beaters can then sand and smooth it before primer is set. Putty fillers should be carefully and quickly prepared and laid to ensure a smooth finish.

Dolly- on hammering

- Hold dolly against back of damage and hammer right over to of dolly.
- Repeatedly move point of hammer impact and dolly slightly, each blow overlapping.
- Start at outside and work towards center.
- Shapes of dolly and hammer must match desired shape of panel.
- Start with light hammer blows, and work up to stronger blows.

Dolly-off hammering

- It is used to raise low spots and lower high sport simultaneously.
- The hammer hits the panel slightly to one side of where the dolly is being held.
- It is often used to rough out or shape large areas of damage during initial straightening.

Q10. How to repair rusted Panels?

Ans: -

Although we usually envision collision repair whenever we think of automotive bodywork, rust repair is often just as common. Rust may be rare in some regions, but it is all too common in the rest of the world.

Anywhere that humidity meets unprotected sheet metal, rust is hard at work eating its way through your automobile's sheet metal. Sadly, you may not even know that the rust is present, as it tends to do its damage to area of your vehicle that you don't normally see during everyday operation. When you dealing with rust, you should determine whether it is just surface rust or a rust-through.

Registration No.: .....

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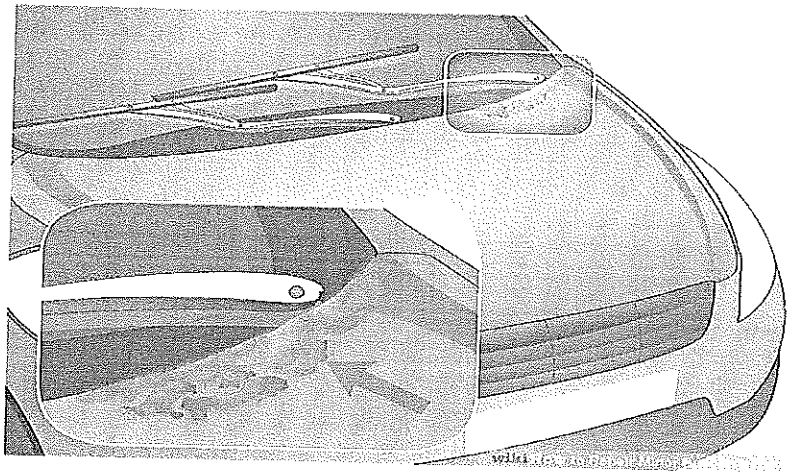

MINOR SURFACE RUST REMOVAL

1) Mask off the affected area with paint-appropriate tape. You want a few inches of protection surrounding the rust spot.
2) Follow the directions on the rust remover, usually spraying or brushing it onto the rust and letting it sit for a few minutes. Then, wipe off any residue with a clean rag. Remember that rust remover is nasty stuff, so be sure to wear the appropriate protective gear when handling it.
3) The rust should be gone, but remove any leftover rust with sandpaper.
4) Clean with a grease and wax remover soap, then air dry.
5) Spray primer in a light-to-medium coat, and allow an hour to dry. Spray three coats.
6) Spray the color base coat, going thinner than the primer. You may have to do five or six coats for complete coverage. Give it plenty of time between coats to prevent drips.
7) Spray the clear coat. Wait two or 3 days before washing, and wait a minimum of two months (some body shops suggest waiting for six) before waxing.

MAJOR RUST REMOVAL

1) Mask off the affected area. If sanding through paint and primer, cover the rest of the vehicle to protect it from the super-fine dust.
2) Use a grinder with a sanding wheel to remove as much surface rust as you can. When removing the rust, remember not to bear down any heavier than you absolutely need to.
3) Clean the work area with grease remover.
4) Use a fiberglass-reinforced body filler for holes and depressions left over after digging out the rust. Allow it to cure completely. This could take quite some time, and shouldn't be done at all if it's any cooler than about 65 degrees outside.
5) Sand the filler with progressively finer grit sandpaper, and then clean with wax and grease remover.
6) Tape off the area to be painted.
7) Use the self-etching primer and wait the required drying time.
8) Spray several light coats of paint.
9) Finish with a coat or two of clear. Like above, hold off on washing and waxing.

Q11. How to Replace a Windshield?

Ans: -

- There are basically two types of windows in an automobile: fixed glass and opening glass. Fixed glass is used in windows that do not open, such as the windshield, back window, and rear quarter windows.
- Glass from fixed windows is taken out by first removing any trim around the window seal, removing the rubber by using a special tool designed for the task, then pushing the window glass outward. Any residual window caulk or sealant must be removed from the sheet metal around the window opening. Some of these windows are glued in place, while others are held in place by rubber weather strip. For the type that is glued in place, the sheet metal window opening must be free or debris or broken glass and clean and free of contaminants; this can be ensure by cleaning with wax and grease remover, then applying the glue to the flange in the windows opening. The glass is then set into position and pressed into place to ensure full contact with the glue. Leave the vehicle for the proper amount of time for the glue to set.
- For the glass that is secured by weather strip, as with the glued-in type, the sheet metal window opening must be clean. The rubber weather strip is stretched around the window glass, making sure that the weather strip is properly oriented around the glass. Spray silicone is then applied to the inside lip of the weather strip and a thin cord or rope (about 1/8 inch in diameter) is slid into the lip that fits around the flange in the window opening. The cord or rope should overlap at the top or bottom of the glass so that it protrudes toward the inside of the vehicle long enough that you can hold opposite ends of the rope in each hand.
- With the help of an assistant, the glass and weather strip is set in place outside the vehicle. By pulling the rope inward (out of the weather strip), the weather strip can pass over the window opening flange. The cord or rope is pulled in slowly while the assistant outside of the vehicle pushes the glass in place.

Q.P.

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Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 3rd Semester,

2nd In-Sem. Examination

Course Code: AUT1304 **Time: 1 Hour**

Course Name: Automotive Refinish Painting **Max. Marks: 20**

Instruction: Attempt all Questions.

Section – A

05X01 = 05 Marks

Q-1. Which type of paint is environment friendly and safe for paint technician health?

a. Waterborne
c. NC Paint
b. Synthetic Paint
d. 2K Paint

Q-2. Which of the following components provide color to the paint?

a. Binder
c. Solvents
b. Pigments
d. Additives

Q-3 What is the baking temperature for 2K refinish paint?

a. 30 Degree Celsius
c. 60 Degree Celsius
b. 45 Degree Celsius
d. 90 Degree Celsius

Q-4. Which one of the parameter is not consider for spraying?

a. Gun Distance
c. Gun Speed
b. Spray Gun Angle
d. Spray Gun Height

Q-5. Paint Mixing Machine should run_____.

a. Twice a day for 15 minutes
c. Twice a day for 5 minutes
b. Twice a week for 15 minutes
d. Twice a week for 5 minutes

Section – B

03X02 = 06 Marks

Q-6. Write a short note on Maskng.

Q-7. Discuss the correct parameters of spray gun handling.

Q-8. Write the putty and primer sanding processes.

Section – C

03X03 = 09 Marks

Q-9 Explain any four refinish painting defects.

Q-10. Write do's and don'ts of paint booth.

Q-11. Explain Different types of masking techniques and material which is required for masking.

Answer Key

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Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 3rd Semester,

2nd In-Sem. Examination

Course Code: AUT1304 **Time: 1 Hour**

Course Name: Automotive Refinish Painting **Max. Marks: 20**

Instruction: Attempt all Questions.

Section – A

05X01 = 05 Marks

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a. **Waterborne**
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a. Binder
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c. **60 Degree Celsius**
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d. **Spray Gun Height**

Q-5. Paint Mixing Machine should run_____.

a. Twice a day for 15 minutes
c. Twice a day for 5 minutes
b. Twice a week for 15 minutes
d. Twice a week for 5 minutes

Section – B

03X02 = 06 Marks

Q-6. Write a short note on Maskng.

Ans Masking is a technique in which auto body masking tape is applied on the car to mask off the areas that should not be treated or painted.

Masking tape, also known as painter's tape, is a type of pressure-sensitive tape made of a thin and easy-to-tear paper, and an easily released pressure-sensitive adhesive.

Q-7. Discuss the correct parameters of spray gun handling.

Ans The angle of gun should be 90 degrees to the panel.

2. The pressure of gun should be 2-3 bar.

3. The distance between the panel and gun should be 5-8 inches.

4. The discharge should be 2.5 rounds of the discharge knob.

5. Overlapping should be 50% in each lap.

Q-8. Write the putty and primer sanding processes.

Ans:

Section – C

03X03 = 09 Marks

Q-9 Explain any four refinish painting defects.

Ans.

Mottling/Clouding

Cause:

> Incorrect quantity of thinner, usually under thinning.
> Holding the gun too close to the job.
> In correct spray gun pressure.
> In sufficient time between coats.
> Incorrect spray booth temperature.

Prevention:

> Use recommended thinning ratio.
> Choose suitable spray gun set up.
> Follow flash off times between coats as recommended.
> Do not pile-in heavy wet coats.

Remedy:

>If mottling has occurred, allow color coat to set up, then apply another double coat using correct thinning ratio and spray technique. (Cross coating recommended.)
>After clear had through-dried, sand surface and repaint.

Runs/Sagging

Cause:

> In correct spraying viscosity, spraying technique, flash-off times between coats , and film thickness.
> Defective Spray gun set up.
> Incorrect spraying pressure
> Temperature of paint, substrate or spray booth too low.
> Incorrect choice of hardeners and thinners.

Prevention:

> Follow application recommendations and technical data sheets.

> Regulate fluid adjustment on spray gun to cut down flow of material.

> Increase flash-time between coats.

> Don't hold gun too close. Move at a uniform speed at right angles to the surface.

Remedy:

> In case of minor area affected cut the runs by sand paper P1500 and Polish

> In case of major wait till complete drying and then Sand the runs and Re-paint

Q-10. Write do's and don'ts of paint booth.

Ans.

Q-11. Explain Different types of masking techniques and material which is required for masking.

Ans In order to carry out this process of masking we have range of materials such as:-

- Masking Paper
- Plastic sheet masking
- Masking tapes
- Caps and plugs
- Masking rope

Masking Paper

Paper has been and is the material most used to mask or protect areas not to paint.
It is used to resist the solvents and diluents containing in the paint.
It has low acquisition cost and easy of placement on flat surfaces.

Plastic sheet masking

The plastic sheet masking has been the technological evolution of the paper in masking
It has characteristics of resistance to solvents, temperature and handling.
The main advantage of using these films is the easy adaptation to the contours.

Masking tapes

Among the wide range of masking tapes on the market, we can classify them into three groups:

- General masking tapes
- Fine masking tapes
- Trim masking tapes

Plugs and caps

The use of plugs for masking or covering of nuts and both plain and threaded holes.
Generally are made of silicone because of its high resistance to solvents, temperature and handling.

Masking rope

Masking rope are self-adhesive foam strips used in holes and openings.

This type of masking material is used on the edges of the doors, hinged covers

The purpose of masking rope is to prevent the penetration of the spray paint into the hole.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 3rd Semester,

2nd In-Sem. Examination

Course Code: AUT1305 **Time: 1 Hour**

Course Name: Automotive Electrical & A.C. **Max. Marks: 20**

Instruction:

1. Attempt all the questions.
2. Draw neat and clean diagram.

Section – A

5X01 = 5 Marks

1. The capacity of battery is expressed in terms of:
   a) Current rating
   b) Voltage rating
   c) Ampere hour rating
   d) None of the above

2. If a battery is to be charged at a much higher rate as compared to normal charging rate, the charging should be restricted to:
   a) 95% of the capacity of battery
   b) 80% of the capacity of battery
   c) 55% of the capacity of battery
   d) 35% of the capacity of battery

3. The process of producing electric current through the variable magnetic field is called.....
   (a) Electrification
   (b) Patience
   (c) Electromagnetic induction
   (d) Parabolic

4. A transformer transform:
   (a) Current
   (b) Voltage
   (c) Both A and B
   (d) frequency

5. The property of materials in which the application of mechanical stress generates electricity is called:
   a) Static electricity
   b) Piezoelectricity
   c) Conductivity
   d) None of the above

Section – B

02X03 = 06 Marks

1. What is transformer? and Explain its function.
2. Explain piezoelectric effect.
3. The charging and discharging of vehicle battery done through which electrical components? Name them.

Section – C

03X03 = 09 Marks

1. Explain principal of operation, working and chemical reaction of lead acid battery.
2. Explain faraday law of electromagnetic induction.
3. Differentiate between step up transformer and step down transformer.

Answer Key

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 3rd Semester,

2nd In-Sem. Examination

Course Code: AUT1305 **Time: 1 Hours**

Course Name: Automotive Electrical & A.C. **Max. Marks: 20**

Instruction:

1. Attempt all the questions.
2. Draw neat and clean diagram.

Section – A

5X01 = 10 Marks

1. C
2. B
3. C
4. C
5. B

Section – B

02X03 = 6 Marks

1. Transformers are electrical devices consisting of two or more coils of wire used to transfer electrical energy by means of a changing magnetic field. Function of a transformer is to transform alternating current energy from one voltage to another voltage.

2. Piezoelectric Effect is the ability of certain materials to generate an electric charge in response to applied mechanical stress.

3. Alternator and startor motor

Section – C

03X03 = 09 Marks

1. Principal and working: When the sulfuric acid dissolves, **its molecules break up into positive hydrogen ions ($2H^+$) and sulphate negative ions (SO_4^-) and move freely**. ... The SO_4^- ions being negatively charged moved towards the electrodes connected to the positive terminal of the supply main (i.e., anode).

At the anode: $Pb + HSO_4^- \rightarrow PbSO_4 + H^- + 2e^-$

At the cathode: $PbO_2 + 3H^+ + HSO_4^- + 2e^- \rightarrow PbSO_4 + 2H_2O$

Overall: $Pb + PbO_2 + 2H_2SO_4 \rightarrow 2PbSO_4 + 2H_2O$

2. It is a basic law of electromagnetism predicting how a magnetic field will interact with an electric circuit to produce an electromotive force (EMF). This phenomenon is known as electromagnetic induction.

3. Step up and step down transformer

BASIS FOR COMPARISON	STEP-UP TRANSFORMER	STEP-DOWN TRANSFORMER
Definition	Step-up transformer increase the output voltage.	Step-down transformer reduces the output voltage.
Voltage	Input voltage is low while the output voltage is high.	Input voltage is high while the output voltage is low.
Winding	High voltage winding is the secondary winding.	High voltage winding is the primary winding.
Current	Current is low on the secondary winding.	Current is high on the secondary winding.
Rating of output voltage	11000 volts or above	110v ,24v, 20v, 10v, etc.
Size of the conductor	Primary winding is made up of thick insulated copper wire.	Secondary winding is made up of thick insulated copper wire
Application	Power plant, X-rays machine, microwave, etc.	Doorbell, voltage converter etc.