BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2019-20 (Summer Semester)

B. Voc. Program, 3rd Semester,

End-Sem. Examination

Course Code: AUT1302 **Time: 2 Hours**

Course Name: Automotive Braking, Suspension and Steering **Max. Marks: 50**

Instruction: Attempt All Questions

Section – A

10X01 = 10 Marks

Q.1 Recirculating ball type steering mechanism uses:

a) Balls is worm gear

b) Sector gear

c) Neither 'a' nor 'b'

d) Both 'a and 'b'

Q.2 Tire thump and vibrations can be caused due to:

a) Tire Cupping
b) Excessive Radial Run Out
c) Manufacturing defect
d) All of the above

Q.3 In HPS If the working piston is fully extended in one direction at full steering angle, the pressure is reduced via a

a) Fluid Control Valve
b) Fluid Hoses
c) Pressure Relief Valve
d) Pressure Vent

Q.4 Which component of HPS feeds information about demand on the power steering system to the vehicle's engine ECU?

a) Rotary valve

b) Control Bushing

c) Pressure Switch

d) Control Sleeve

Q.5 What is the range of steering ratio for power steering system in cars?

a) 12:1-17:1

b) 19:1-25:1

c) 22:1-33:1

d) 15:1-21:1

Q 6. I Which component of suspension system is made of a special round spring steel wrapped in a helix shape?

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

Q 7. The rotor of Disc brakes is made of:

a) Mild Steel

b) Stainless Steel

c) Cast Iron

d) Hard Iron

Q 8. The friction lining on brake shoes or the brake pads is done using:

a) Bakelite

b) Asbestos

c) Silicon

d) Diamond

Q 9. Which type of suspension is also known as SLA Type of suspension?

a) Macpherson Strut

b) Wishbone

c) Spring

d) Rigid

Q 10. The leaves of a leaf spring are held together by a:

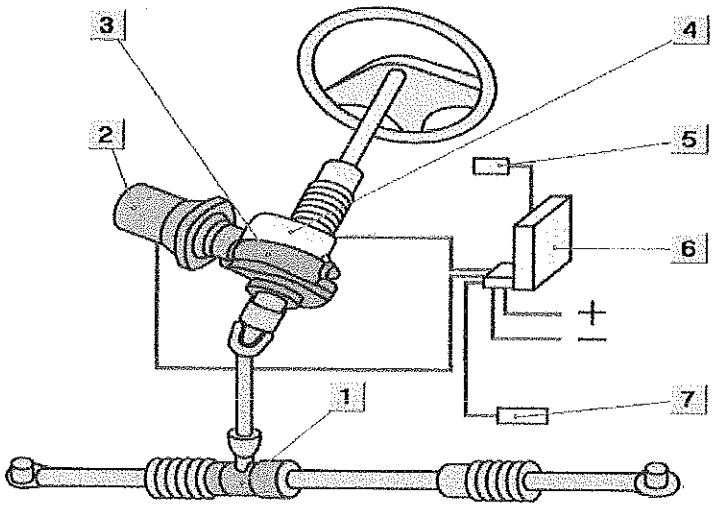
a) Centering Pin
b) Centre Bolt
c) Both a & b
d) None of them

Section – B

04X04 = 16 Marks

Q 11. What is steering ratio and how is it calculated? Give an example for calculations done for finding Steering Ratio.

Q 12. Label the diagram given below. Also mention which type of steering system is illustrated in the diagram.



Q 13. Write the differences between a single tube and double tube shock absorber with the help of a diagram.

Q 14. Write a short note on:

a. Leaf Springs

b. Spring Rate

Section – C

04X06 = 24 Marks

Q 15. Describe all different methods of tyre repair, also mention the advantages of each of them.

Q 16. Which system must be used for avoiding skidding of vehicle in case of sudden braking? Explain the components and working of this system in details.

Q 17. Explain the methods for diagnosis/testing of a suspension system to identify the related problems.

Q 18. Explain the following:

a. Wishbone Type of suspension system
b. McPherson Strut suspension system

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End-Sem. Examination

Course Code: AUT1302 **Time: 2 Hours**

Course Name: Automotive Braking, Suspension and Steering **Max. Marks: 50**

Instruction: Attempt All Questions

Section – A

10X01 = 10 Marks

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a) Centering Pin
b) Centre Bolt
c) Both a & b
d) None of them

Section – B

04X04 = 16 Marks

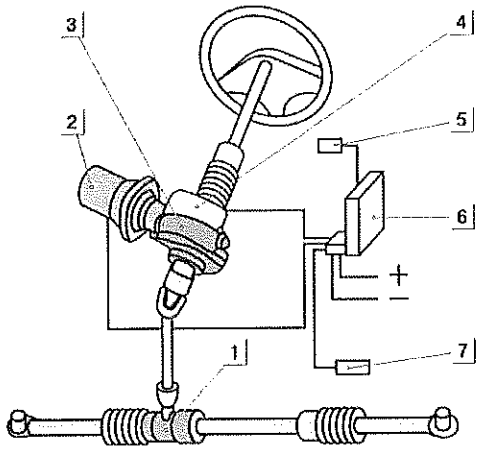
Q 11. What is steering ratio and how is it calculated? Give an example for calculations done for finding Steering Ratio.

- When the steering wheel is rotated from lock-to-lock the front wheels turn about 30° each in each direction from the straight-ahead position. Therefore, the total front wheel movement from left to right is approximately 60°.
- The steering gear must have a ratio that allows more steering wheel rotation in relation to front wheel movement. A steering ratio of 15:1 is acceptable, and this ratio provides 1° of front wheel movement for every 15° of steering wheel rotation.
- 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.

Q 12. Label the diagram given below. Also mention which type of steering system is illustrated in the diagram.



1. Mechanical steering gear
2. Electric motor
3. Worm gear unit
4. Torque sensor
5. Distance signalling device
6. Control unit
7. Speed signal transmitter

Q 13. Write the differences between a single tube and double tube shock absorber with the help of a diagram.

- The hydraulic shock absorber operates on the principle of fluid being forced through a small opening (orifice). Besides small openings, pressure relief valves are built into most shock absorbers to control vehicle ride under all operating conditions. The greater the pressure drop of the fluid inside the shock and the greater the amount of fluid moved through the orifice, the greater the amount of dampening; therefore, larger shock absorbers can usually provide better dampening than smaller units.

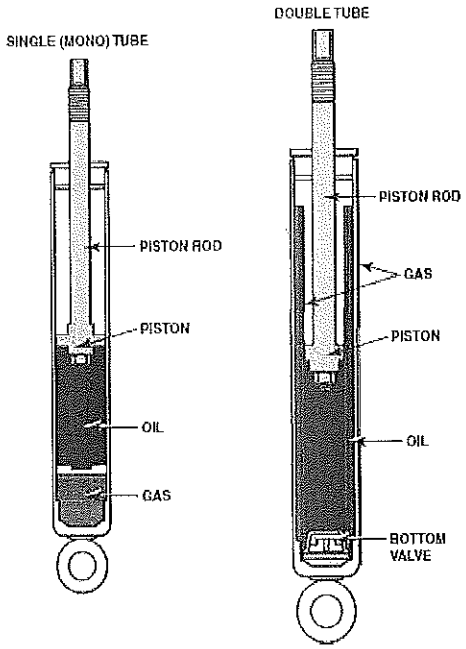


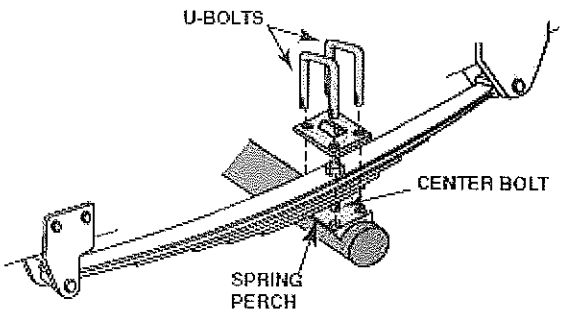
FIGURE 112-49 Gas-charged shock absorbers are manufactured with a double-tube design similar to conventional shock absorbers and with a single or monotube design.

Q 14. Write a short note on:

a. Leaf Springs

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.*



b. Spring Rate

- 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.

Section – C

04X06 = 24 Marks

Q 15. Describe all different methods of tyre repair, also mention the advantages of each of them.

- Tire repairing process:

We will discuss three common tire repair procedures

1. Plug Installation Procedure.
2. Cold Patch Installation Procedure.
3. Hot Patch Installation Procedure.

- Plug Installation Procedure

1. Buff the area around the puncture with a wire brush or wire buffing wheel.
2. Select a plug slightly larger than the puncture opening, and insert the plug in the eye of the insertion tool.
3. Wet the plug and the insertion tool with vulcanizing fluid.
4. While holding and stretching the plug, pull the plug into the puncture from the inside of the tire (Figure 4-15). The head of the plug should contact the inside of the tire. If the plug pulls through the tire, repeat the procedure.

5. Cut the plug off 1/32 in. from the tread surface. Do not stretch the plug while cutting.

- Cold Patch Installation Procedure:

1. Buff the area around the puncture with a wire brush or buffing wheel.
2. Apply vulcanizing fluid to the buffed area and allow it to dry until it is tacky.
3. Peel the backing from the patch, and apply the patch over the puncture. Center the patch over the puncture.
4. Run a stitching tool back and forth over the patch to improve bonding.

- Hot Patch Installation Procedure:

Buff the area around the puncture with a wire brush or buffing wheel. 2. Apply vulcanizing fluid to the buffed area, if required.
3. Peel the backing from the patch and install the patch so it is centered over the puncture on the inside of the tire. Many hot patches are heated with an electric heating element clamped over the patch. Th is element should be clamped in place for the amount of time recommended by the equipment or patch manufacturer.
4. After the heating element is removed, allow the patch to cool for a few minutes and be sure the patch is properly bonded to the tire.

Q 16. Which system must be used for avoiding skidding of vehicle in case of sudden braking? Explain the components and working of this system in details.
Antilock braking systems (ABS) help prevent the wheels from locking during sudden braking, especially on slippery surfaces. This helps the driver maintain control. Antilock brakes increase safety because they eliminate lockup and minimize the danger of skidding, allowing the vehicle to stop in a straight line. ABS also allows the driver to maintain steering control during heavy braking so the vehicle can be steered to avoid an obstacle or another vehicle.

- On dry or wet pavement, maximum braking traction occurs when tire slip is held between approximately 15% and 30%.

ABS can improve braking when road conditions are less than ideal, as when making a sudden panic stop or when braking on a wet or slick road. ABS does this by monitoring the relative speed of the wheels to one another. It uses this information to modulate brake pressure as needed to control slippage and maintain traction when the brakes are applied.

ABS COMPONENTS: Basic components that are common to all antilock brake systems include the following.

- Wheel speed sensors
- Electronic control unit
- ABS warning lamp
- Hydraulic modulator assembly with electrically operated solenoid valves (or motor-driven valves in the case of Delphi ABS-VI

Q 17. Explain the methods for diagnosis/testing of a suspension system to identify the related problems.
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 steering or suspension.

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 18. Explain the following:

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. Wishbone

- The short/long-arm suspension uses a short upper control arm and a longer lower control arm and usually is referred to as the *SLA-type suspension.* This type of suspension system goes by a variety of names, including unequal-arm suspension, double-wishbone suspension, or **A-arm** suspension.

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School of Automotive Skills

Session: 2019-20 (Summer Semester)

B. Voc. Program, 3rd Semester,

End-Sem. Examination

Course Code: AUT1303 **Time: 2 Hours**

Course Name: Automotive Body Works **Max. Marks: 50**

Instruction:

1. Answer all questions from **"Section-A"**, each question carries 01 mark.
2. Answer all questions from **"Section-B"**, each question carries 04 marks.
3. Answer all questions from "**Section-C**", each question carries 06 marks.

Section – A

Directions: Select any one correct answer from the given options: 10X01 = 10 Marks

1) Technician **A** says that the gas flow rate must be regulated before using a GMAW or MIG/MAG welding. Technician **B** says that the wire speed must be adjusted before using a GMAW. Who is right?
   a) Only B
   b) Only A
   c) Both A & B
   d) Neither A nor B
2) Porosity in weld can be caused by:
   a) Excessive current
   b) Ground too far
   c) Slow travel speed
   d) Lacking of shielding gas
3) Which of the following ray is not produce during welding?
   a) Ultra violet rays
   b) Infrared rays
   c) Visible light rays
   d) Gamma rays
4) Machine guards should be fitted to protect the operator and other nearby from……..,
   a) Flying chips and sparks
   b) Rotating parts
   c) Points of operation
   d) All of the these
5) Which of the following basic safety rules should you follow when using hand and power tools?
   a) Use the right tool for the job.
   b) Examine each tool for damage before use and do not use damaged tools.
   c) Keep all the tools in good condition with regular maintenance.
   d) All of these

6) Estimator **A** says that some vehicles use high strength steel (HSS) outer body panels. Estimator **B** says that damaged high strength steel cannot be repaired. Who is right?

a) Only B
b) Only A
c) Both A & B
d) Neither A nor B

7) An upraised part on the hood which directs the air flow into the engine compartment is called.....

a) Hood scoop
b) Bumper
c) Spoiler
d) Wings

8) The objective of car body repair is to put damaged vehicles back into a.....

a) Accidental condition
b) Pre-accident condition
c) Damaged condition
d) All of the above

9) The ionized state of gas is called .....

a) CO_2
b) $Ar+CO_2$
c) Air
d) Plasma

10) Worker operating with hammer do not need.....

a) Safety glasses
b) Safety shoes
c) Hearing protection
d) Respirator

Section – B

04X04 = 16 Marks

11) What are the various safety practices that must be followed in an Automotive Body Repair Sections?
12) Write the SOP of removing front bumper assembly.
13) Mention the advantages of using sanding blocks during dry sanding.
14) What are the advantages and disadvantages of chemical stripping?

Section – C

04X06 = 24 Marks

15) Explain the different kinds of tools used in an Auto Body Repair.
16) Explain about the laminated glass and also write its advantages and applications.
17) Discuss the Traditional and PDR dent repair techniques.
18) Write short notes on:

a) Mini Puller
b) Grinder
c) Carbon Heating Electrode

(A)

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End-Sem. Examination

Course Code: AUT1303 **Time: 2 Hours**

Course Name: Automotive Body Works **Max. Marks: 50**

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Section – A

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Ans: - c)

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d) All of the these

Ans: - d)

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a) Use the right tool for the job.
b) Examine each tool for damage before use and do not use damaged tools.
c) Keep all the tools in good condition with regular maintenance.
d) All of these

Ans: - d)

6) Estimator **A** says that some vehicles use high strength steel (HSS) outer body panels. Estimator **B** says that damaged high strength steel cannot be repaired. Who is right?

a) Only B
b) Only A
c) Both A & B
d) Neither A nor B

Ans: - b)

7) An upraised part on the hood which directs the air flow into the engine compartment is called.....

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b) Bumper
c) Spoiler
d) Wings

Ans: - c)

8) The objective of car body repair is to put damaged vehicles back into a.....

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b) Pre-accident condition
c) Damaged condition
d) All of the above

Ans: - b)

9) The ionized state of gas is called .....

a) CO_2
b) $Ar+CO_2$
c) Air
d) Plasma

Ans: - d)

10) Worker operating with hammer do not need.....

a) Safety glasses
b) Safety shoes
c) Hearing protection
d) Respirator

Ans: - d)

Section – B

04X04 = 16 Marks

11) What are the various safety practices that must be followed in an Automotive Body Repair Sections?

Ans: -

The Health and Safety at Work Act imposes on employers a statutory duty to ensure safe working conditions and an absence of risk in the use of equipment and the handling of materials, and to comply with Regulations regarding safe working practices in order to reduce to a minimum the hazards to health and safety associated with vehicle body repair

work. To skilled and experienced operators this does not mean that any additional restrictions are imposed on their activities, but merely that they should carry out their tasks with constant regard for the health and safety of themselves and their fellow workers.

- Safety glasses and hearing protection - every person entering the workshop must collect these items from just inside the door. They must be worn at all times.
- Students that wear glasses should be aware these are not safety glasses, they are only impact resistant and may shatter, safety glasses must be worn.
- All loose clothing (e.g. shirts hanging out) must be tucked in.
- Safety boots or enclosed shoes must be worn in the workshop. Do not enter under any circumstances without this footwear, there are no exceptions to this rule.
- Long hair has to be tied up including fringes.
- Remove rings and loose jewelry before operating machinery they can be a hazard

12) Write the SOP's of removing 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

Step 4 - Remove Clips From Under Bumper

- Remove push pin clips from the bottom side of the bumper which hold 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 hose

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.

13) Mention the advantages of using sanding blocks during dry sanding.

Ans: -

- Sanding blocks are commercially available in a wide variety of shapes, styles, size, and materials.
- Sanding can help you to get the best results, but without a sanding block you'll be wasting your time.
- Sanding blocks help you to exert even pressure on the sandpaper, while minimizing waves in the panel being sanded.

14) What are the advantages and disadvantages of chemical stripping?

Ans: -

- Chemical stripping is a process of removing paint and rust from metal surface by the help of chemical.
- If you have several parts or a number of large pieces to be stripped, it will be more practical to strip them commercially.

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.

Section – C

04X06 = 24 Marks

15) Explain the different kinds of tools used in an Auto Body Repair.

Ans: -

Basic tools like hammers, mallets, dollies, sanding blocks, spoons, portable grinders and sanders, stud welders and slide hammers, panel flangers, pneumatic tools, chisel, nibblers, clamps, etc.

16) Explain about the laminated glass and also write its advantages and applications.

Ans: -

Laminated Glass is a Grade A safety glass, manufactured by adhering two or more pieces of glass together with a flexible interlayer. The interlayer is generally either a PVB (poly vinyl butyral) or a CIP (resin). The glass and interlayer are bonded together using heat and pressure in an autoclave. Virtually all glass types can be laminated and the thickness and type of interlayer can be altered to provide solutions for security, sound reduction, solar energy control, UV control, decoration and so on.

Advantage:

In order to guarantee the quality of laminating glass, PVB film we use Dupont of the USA or Sekisui of Japan. The lamination can be glass with stainless steel mesh, or stone and others to achieve best outlook. The colors of the film include transparent, milk, blue, dark grey, light green, bronze, etc.

1) Extremely high safety: The PVB interlayer withstands penetration from impact.
2) Energy-saving building materials: PVB interlayer impedes the transmission of solar heat and reduces cooling loads.
3) Create aesthetic sense to building: Laminated glass with a tinted interlayer will beautify the buildings and harmonize their appearances with surrounding views which meet the demand of architects.
4) Sound control: PVB interlayer is an effective absorber of sound.
5) Ultraviolet screening: The interlayer filters out ultraviolet rays and prevents the furniture and curtains from fading effect.

17) Discuss the Traditional and PDR dent repair techniques.

Ans: -

Traditional dent repair fills in auto body dents with paint or body filler, which is then painted to match the rest of the vehicle's exterior. While this process can make a vehicle look as good as new, it doesn't address the actual dent in a way that is a sustainable, long-term solution. It's also time-consuming, expensive and can impact the re-sale value of your vehicle.

Paintless Dent Repair, on the other hand, requires no fillers and no sanding. More and more consumers are finding PDR to be an effective and inexpensive alternative to getting minor repairs done at a body shop. PDR offers more "bang for your buck" than traditional dent repair methods and is a great way to care for your vehicle's exterior affordably.

18) Write short notes on:

a) Mini Puller
b) Grinder
c) Carbon Heating Electrode

Ans: -

Mini Puller

- It is generally used in deep and targeted dent in small area.
- It reduces the human effort.

Carbon Heating Electrode

- It is the consumables for spot welding of sheet metal shrink repair, dent pulling application.

Grinder

- A sander or grinder is a must-have tool for the quick removal of paint, primer and old body filler from an area being repaired.
- These tools are available in electric or pneumatic models, and in different sizes, motor speeds, and price ranges.
- You have a choice between an electric sander and a pneumatic model. If you don't own an air compressor, an electric sander will suffice, since your shop is most likely small enough to allow for an extension cord to reach electric outlets. If you already have an air compressor that can maintain large volume of air, a pneumatic model may serve your purposes better. Pneumatic sander can withstand longer, nonstop use, while electric models have a tendency to overheat. When it overheats, an electric sander's motor will shut down; you can get the sander going by pressing a reset switch, but this can lead to inconvenient interruptions as you work.

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session: 2019-20 (Summer Semester)

B. Voc. Program, Third Semester,

End-Sem. Examination

Course Code: AUT1304 **Time: 2 Hours**

Course Name: Automotive Refinish Painting **Max. Marks: 50**

Instruction:

1. Answer all questions from section – A, each question carries one mark.
2. Answer all questions from section – B, each question carries Four marks.
3. Answer all questions from section – C, each question carries Six marks.

Section – A

10X01 = 10 Marks

1. Polyester putty is a ...

   a. 2K product
   c. 1K product
   b. 3K product
   d. None of the above

2. Check putty is a ....

   a. 2K product
   c. 1K product
   b. 3K product
   d. None of the above

3. What is the width of each layer in feather edging?

   a. 7-10 mm
   c. 20-30 mm
   b. 0-5 mm
   d. None of these

4. Infrared dryer works on the principle of...

   a. Conduction
   c. Radiation
   b. Convection
   d. All of the above

5. What are the recommended hours for changing floor filters?

   a. 200-250 Hours
   c. 400 – 450 Hours
   b. 300 – 350 Hours
   d. None of these

6. How many angles are required to inspect the metallic color?

   a. 1
   c. 2
   b. 3
   d. 5

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7. Which of the following are secondary colors?

a. Red, blue & yellow
c. Violet, green & blue
b. Green, orange & violet
d. Red, orange & blue

8. DFT meter is used to measure...

a. Thickness of coating
c. Gloss of paint
b. Color quantity
d. All of the above

9. What is the purpose of dry coat?

a. To facilitate sanding
c. a & b
b. To remove dust
d. None of the above

10. The appropriate light for color inspection is...

a. Sun light
c. LED light
b. Sodium light
d. All of the above

Section – B

04X04 = 16 Marks

1. Explain the different angles used for panel inspection?
2. Explain Hue, Value and Chroma?
3. What are the differences between body filler and putty?
4. What is Metamerism?

Section – C

04X06 = 24 Marks

1. Write standard operating procedures for Spot Repair of solid paint.
2. Explain any five paint defects with its causes and prevention.
3. Explain DFT meter, Glossometer, luxometer and viscometer.
4. Write standard operating procedure for minor repair of solid paint.

Zenith carburetor:

The main object of the zenith carburetor is to supply the required quantity of fuel and air mixture of the correct strength as dedicated to the load condition of the engine. Zenith carburetor is also known as "British carburetor" and used by various famous car manufacturers.

So, the Construction and Working of Zenith Carburetor is as below

In this, float chamber is supplied with fuel from the fuel tank through a pipe. Whenever the float chamber falls short of fuel, the fuel from the fuel tank flows into the chamber at the fastest speed. The speed of fuel will match the requirement of an engine. Hence the float rises up, till it reaches a certain level. At this time, a needle valve moves down and rest against the seat. So, it resulting the stoppage of fuel supply from the fuel tank. The main jet is directly connected to the float chamber. While the auxiliary jet which is also called as compensating jet draws fuel from an auxiliary chamber (Reservoir). This auxiliary chamber is connected to the float chamber through an orifice. Both, main and auxiliary jet is opened up in the venturi. The air to the carburettor is supplied through the passage. The throttle valve is located at the end of the carburetor and connected to the engine suction pipe. The opening and the closing of the throttle valve controls the quantity of air-fuel mixture supplied to the engine suction manifold. An auxiliary nozzle from an auxiliary chamber (Reservoir) is located at one end of the by-pass. The other end of this nozzle opens up near the throttle valve.

Working of Zenith Carburetor at Starting and Low-Speed Running

Because of lower velocity of air at the time of starting or slow speed of the engine, the suction produced at the venturi is quite insufficient to operate the main and the auxiliary jet in a nozzle. To improve the velocity of air, the throttle valve is closed to such an extent that there is only a small contracted passage is provided near the end of by-pass. By this, the velocity of air, passing through the region increases, producing the high suction. This operates the nozzle at the auxiliary chamber and the air-fuel mixture supplied through the holes. There is starting and slow running device is fitted in the reservoir (Auxiliary Chamber). To vary the supply of air to the nozzle, the set screw given is slackened and the whole assembly is taken out. By the suitable number of rotation of screw joint, the position of an auxiliary nozzle is set. The whole device is then again fitted to the carburettor and tightened the screw.

Working of Zenith Carburetor at Normal Running

At this condition, the throttle valve is opened about 66% and as the air entering through the passage. It passes through the venturi, its velocity increases due to smaller area consequently its pressure drops. Hence resulting in the suction effect. The fuel is sprayed in the venturi by a main and auxiliary nozzle. As the speed of the engine increases, thereby producing the greater suction. Due to this, greater fuel being supplied by the main nozzle. Since the compensating jet (Auxiliary Jet) draws fuel from a reservoir (Auxiliary Chamber), which is subjected to atmospheric pressure, through the air, the quantity of fuel supplied by it to the venturi does not change to an appreciable extent. This has the effect of supplying a weaker solution than if only one jet were a provider in which case, the air-fuel mixture supplied at high speed will be richer than desired. Thus the compensating jet enables the air-fuel mixture of the desired strength to be supplied. In fact, with the correctly proportioned design of various parts of this carburettor, the fuel supplied by the main and compensating nozzle can be made to bear almost a constant ratio to the air supplied.

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 Sulphur 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.18 Explain types of carburetor.

Ans: **Types of Carburetor**

- Carter carburetor
- Zenith carburetor
- Solex carburetor
- Solex mikuni double venture carburetor

Carter carburetor is an automobile carburetor used mostly in jeeps. In the previous article, we have discussed the other type of automobile carburetor called solex carburetor. In this article, we are going to discuss the Carter carburetor construction and the working principle. Carter Carburetor is a downdraught type Carburetor. It is having multiple jets, a plain tube with only one adjustment for the idling or low speed running of the engine.

Carter Carburetor Construction

A float with a tapered valve at the top face of the float is arranged in the float chamber to take care of the fuel level in it. The air enters at the top of the tube operated by the choke valve. During normal operation, the choke valve will be fully opened. This carburetor is comprised of 3 venturi tubes. Among these, the smallest one is maintained a little bit above to the level of fuel in the float chamber. The other two will be below the level of the fuel in the float chamber.

The fuel nozzle injects the fuel at the primary venturi and throws the fuel against the air flow coming from the top. The air and the fuel mixed at the primary venturi and flow thru the secondary venturi and exposed to some more air steam and further flow thru the third venturi as well. After this, the fuel mixture enters into the engine during the suction stroke. There is a metering rod provided at the float chamber, which controls the quantity of fuel supply to the engine.

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.

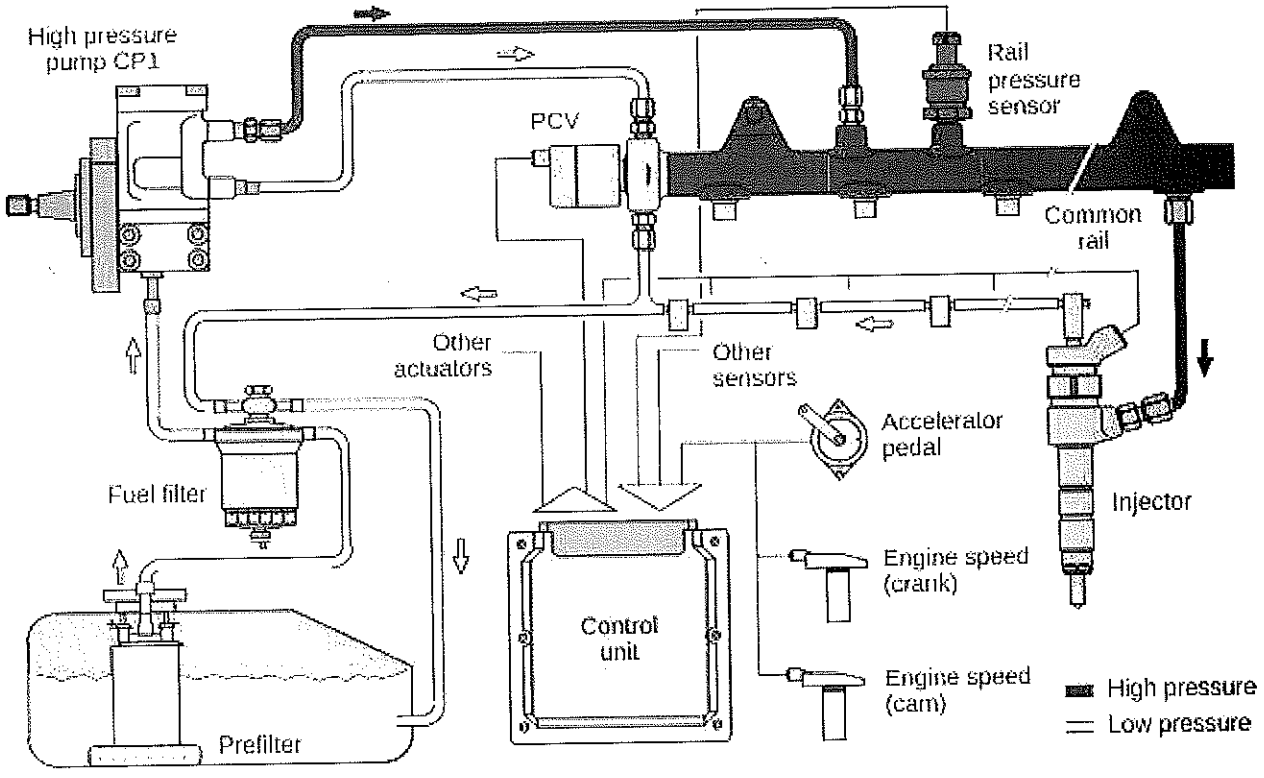
FUEL INJECTION SYSTEMS

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.

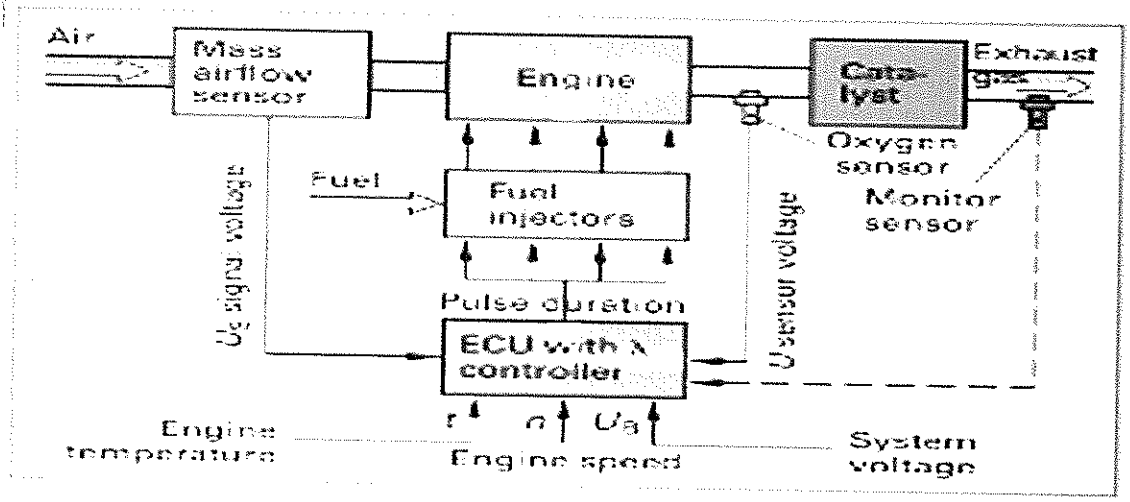
High Pressure Common Rail Fuel System Diagram



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.



Diagnostics and Maintenance of Exhaust System:

- **Preparation:**
  - Inspect vehicle documents to ensure they match the vehicle.
  - Choose the selection procedure to be applied.
  - Record vehicle ID information: registration, mileage, initial registration, vehicle manufacturer, make and model, VIN, type of fuel.
- **Conducting the Emission Inspection (EI):**
  - Check pollutant-relevant data such as ignition point and idle speed.
  - Emission test of CO at idle speed and increased idle speed.
  - Lambda valve at increased idle speed.
  - Control loop check.

Q.17 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.

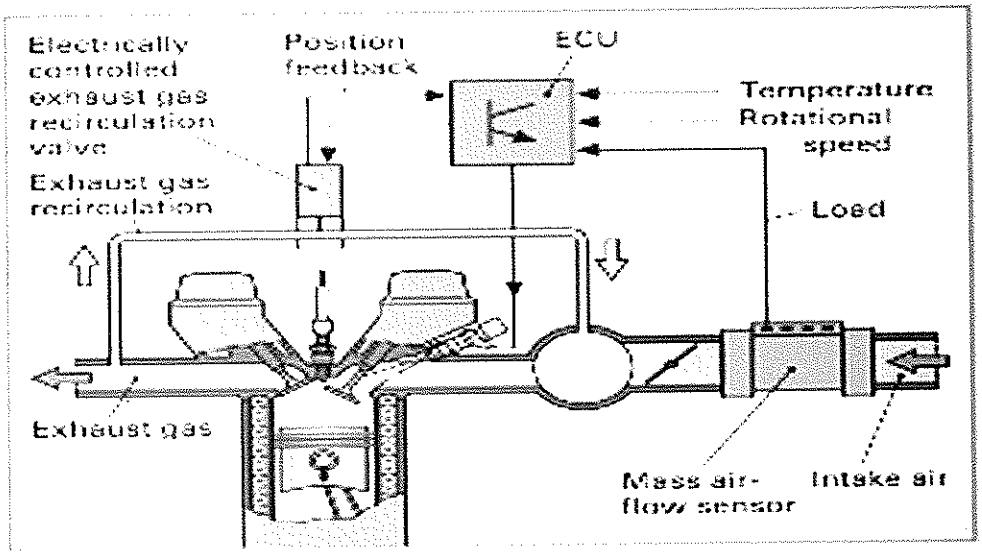
FUEL LINES

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.

- **Turbocharger with charge-air cooling:** Increase in power output per litre with simultaneously reduction of peak combustion chamber temperature. This reduced the formation of NOx.

EGR System:

- External exhaust gas recirculation involves a portion of the exhaust gas being removed shortly after the exhaust manifold and being remixed with the fuel-air mixture in the intake manifold.



- It reduced the charge of fuel-air mixture supplied to the cylinders.
- The combustion temperature is reduced since the recirculated exhaust gas components are no longer able to take part in combustion.
- And only up to 40% NOx formed.
- It is deactivated when rich Fuel-air mixtures are being burnt during which few NOx are formed, e.g. cold starting, warming up, accelerating, full load.
- An EGR valve is installed in between the exhaust manifold and the intake manifold.
- The EGR rate is controlled as a function of engine temperature, load and engine speed.

Oxygen Sensor:

- The lambda or oxygen sensor is installed before the catalyst.
- A second oxygen sensor installed after the catalyst serves to monitor the catalyst function.
- Conditions for lambda closed-loop control:
    - Sensor temperature higher than 300 degrees centigrade.
    - Engine in idle or part-load range.
    - Engine temperature higher than 40 degrees centigrade.

- Better oil cooling is achieved because the oil supply reservoir is isolated from the engine and thus from the heat of the engine.
- Since dry sump lubrication is more expensive than forced-feed lubrication, it is usually used only in low sports cars, off-road vehicles and motorcycles.
- Engine Lubrication Components:
- Oil pan.
- Oil pump.
- Pressure limiting valve.
- Oil filter.
- Oil pressure gauge.
- Ventilation.
- Overflow valve.
- Oil cooler.
- Oil Pan:
- This holds the oil supply for the engine.
- The lowest point of the oil pan is frequently equipped with anti-rolling walls, which prevent the oil from flowing away from the suction point during cornering, acceleration and braking.
- The surface of the oil pan also acts as a cooling surface for the oil supply.
- The oil pan normally made up of light-metal alloy.
- The oil pan is sealed by flat gaskets or increasingly by liquid seal with silicon.

Q.16 Explain engine emission control system.

Ans: **Procedures for reducing pollutants:**

- It is possible to reduce the pollutants constituents in the exhaust gases by using suitable fuel in conjunction with on-engine measures or after-treatment of the exhaust gases.
- **On-engine measures:** A reduction in pollutants is achieved by burning the fuel-air mixture as completely as possible by reducing the fuel consumption. The following On-engine measures can improve the exhaust gas quality:
    - **Suitable engine design:** optimization of combustion chamber and compression ratio; variable intake manifolds; variable valve control with regard to opening time and lift; de throttling of induction process
    - **Type and quality of mixture formation:** exterior/interior mixture formation, homogeneous mixture; stratified charge.
    - **Exhaust gas recirculation:** Internal by valve overlap; external by exhaust gas recirculation.
    - **Engine management system:** Map-controlled ignition and fuel injection, overrun fuel cut-off; boost-pressure control; selective cylinder cut-off; checking function of exhaust-gas-relevant components, e.g. oxygen sensors, catalyst.

Lubricating Systems:

- Two different types of system may be used in four-stroke engines:
  - Forced-feed lubrication.
  - Dry Sump lubrication.
- Likewise, in two-stroke engines:
  - Mixture lubrication.
  - Total-loss lubrication.

Lubrication points:

- Crankshaft bearings.
- Connecting rod bearings.
- Gudgeon pin bearings.
- Tappets.
- Camshaft bearings.
- Can tracks.
- Rocker arms.
- Timing chain.
- Chain tensioner.
- Cylinder barrel and exhaust gas turbocharger.

Forced-feed Lubrication:

- This is the most commonly used system.
- A pump draws in the supply of oil from the oil pan through an oil strainer and forces it through pipes and lubricating passages to the engine lubrication points.
- Several oil pressure and suction pumps can be installed in modern-day engines. Filters and occasionally oil coolers as well are connected in-between.
- The oil trickles off from the lubrication points and flows back to the oil pan.
- The oil supply can be checked with a dipstick.
- Electric oil sensors, which enable the oil content and oil quantity to be displayed in the instrument panel, are also being increasingly installed.
- Dry Sump Lubrication:
- This is a special type of forced-feed lubrication system.
- In this the oil returning to the oil pan is directed by a suction pump to a separate oil supply reservoir.
- A pressurized oil delivery pump extracts the oil from this reservoir and forces it to the lubrication points via a filter and if necessary an oil cooler.
- Advantages of dry sump lubrication:
- The flat oil pan reduces the height of the engine and thus the vehicle's centre of gravity.
- Perfect lubrication is guaranteed in the event of large engine inclinations.

Liquid lubricants: these are mineral oils or synthetic oils alloyed with additives. Since the oil adheres to the surfaces sliding on each other, there is an oil film between these surfaces. A lubricating wedge, which lifts the sliding surfaces off each other, is created as a function of the sliding speed.

Paste-like lubricants: these are greases which consists of a structure of lime, soda or lithium soaps into which mineral oils or synthetic oils are intercalated. When the soap structure is moved, oil droplets emerge to moisten the surface to be lubricated.

Solid lubricants: these are composed of fine flake, powdery graphite or molybdenum disulphide (MoS2). The friction is reduced by the fact that the small sliding laminas in the lubricating gap slide on each other.

Engine Lubricating System:

- The engine lubricating system must supply the engine components with an adequate amount of lubricating oil. The correct pressure must be guaranteed in the process.

Functions:

- Lubricate in order to reduce energy losses and wear-inducing friction between those parts that slides on or against each other.
- Cool in order to protect the engine components against overheating because these components cannot give off heat directly to the coolant or to the cooling air.
- Seal in order to guarantee the precision seal between parts that slides on or against each other.
- Clean in order to remove abrasion, deposits and combustion residues or to bind them in the oil so as to render them harmless to the engine.
- Protect against corrosion.
- Damp engine noises because the lubricant layer has a noise and vibration damping effect.

Stresses of lubricating oil:

- The lubricating oil is exposed to high thermal, chemical and mechanical stresses in the engine.
- The correct pressure must be guaranteed in the process.

Reasons for regular oil changes:

- Oil ageing: Air and combustion gases force their way into the crankcase between the piston and the cylinder. This causes the oil to oxidize. Acids may be formed in the process.
- Oil sludging: Separated oleoresins, road sweepings, metallic abrasion and released combustion residues cause oil sludge to form. Sludge formation is further encouraged by condensation water and possibly coolant. Oil sludge can obstruct the oil circuit.
- Oil dilution: The high-boiling fuel constituents, which get into the oil particularly when the engine is cold, result in oil dilution.
- Oil thickening: heavy oil oxidation, combined with the depositing of soot particles, occasionally cause the oil to thicken, mainly in diesel engines.
- Oil consumption: Every engine has a certain level of normal oil consumption, which must be compensated. This is a result of oil entering the combustion chamber, where it burns.

Q.14 What is carburetor and why it is replaced by MPFI system?

Ans:

MPFI vs carburetor tecnology – Multi-point Fuel-Injection (also called fuel-injection system)

The term MPFI is used to specify a technology used in Gasoline/petrol Engines. For Diesel Engines, there is a similar technology called CRDI. We will discuss CRDI in a separate article to avoid confusion.

MPFI System is a system which uses a small computer (yes, a small computer without keyboard or mouse, its more like a microchip) to control the Car's Engine. A Petrol car's engine usually has three or more cylinders or fuel burning zones. So in case of an MPFI engine, there is one fuel injector installed near each cylinder, that is why they call it Multi-point (more than one points) Fuel Injection.

In plain words, to burn petrol in an Engine to produce power, Petrol has to be mixed with some air, ignited in a cylinder (also called combustion chamber), which produces energy and runs the engine. I will not talk of further internal details because it will make this article for Engineers and not common people.

Before MPFI system was discovered, there was a technology called "Carburetor". Carburetor was one chamber where petrol and air was mixed in a fixed ratio and then sent to cylinders to burn it to produce power. This system is purely a mechanical machine with little or no intelligence. It was not very efficient in burning petrol, it will burn more petrol than needed at times and will produce more pollution. But with the advancement of technology this was about to change.

MPFI emerged an Intelligent way to do what the Carburetor does. In MPFI system, each cylinder has one injector (which makes it multi-point). Each of these Injectors are controlled by one central car computer. This computer is a small micro-processor, which keeps telling each Injector about how much petrol and at what time it needs to inject near the cylinder so that only the required amount of petrol goes into the cylinder at the right moment.

Section – C

04X06 = 24 Marks

Q.15 Explain engine lubrication and its components.

Ans: **Lubrication:**

- Lubricants are used to minimize wear between moving parts.
- They are intended to prevent the surfaces that slide on each other from coming into contact with each other.

Functions:

- Reduce Friction.
- Damp impact shocks.
- Protect against corrosion.
- Provide a fine seal.
- Damp noises.
- Dissipate heat.
- Remove wear particles.

Types of lubricants:

Water freezes at 32°F (0°C).

When water freezes, it increases in volume by about 9%. The expansion of the freezing water can easily crack engine blocks, cylinder heads, and radiators.

A curve depicting freezing point as compared with the percentage of antifreeze mixture is shown in.

It should be noted that the freezing point increases as the antifreeze concentration is

increased above 60%. The normal mixture is 50% antifreeze and 50% water. Ethylene glycol antifreeze contains:

Anticorrosion additives

Rust inhibitors

Water pump lubricants

Q.13 Write the difference between mechanical injection and electronic injection system.

Ans: Mechanical Injection

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.

- Electronic Injection

Electrical fuel pumps draw 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 line

Q.9 Which is the most commonly use antifreeze ?

a. Ethyl octane
c. Alcohol
b. Water
d. **Ethylene glycol**

Q.10 . The maximum temperature in the I.C. engine cylinder is of the order of

a. 500-1000°C
c. 1500-2000°C
b. 1000-1500°C
d. 2000-2500°C

Section – B 04X04 = 16 Marks

Q.11 Write short note on

a. Engine gasket
b. Engine oil

Ans: (a) Gaskets and sealants are used in engines to seal gaps and potential gaps between two or more parts. Gaskets and sealants must be able to withstand:

1.Temperatures to which the engine part may be exposed during normal operation

2. Vibrations produced in the engine and the accessories that are attached to the engine

3. Acids and other chemicals that are found in and throughout an engine

4. Expanding and contracting at different rates (They must be able to seal even though the two parts are expanding and contracting at different rates as the engine is started at low temperature all the way to normal operating temperature and repeating this cycle every time the engine is operated.)

Ans: (b)

Engine oil has a major effect on the proper operation and life of any engine. Engine oil provides the following functions in every engine.

1. Lubricates moving parts
2. Helps cool engine parts
3. Helps seal piston rings
4. Helps to neutralize acids created by the by-products of combustion
5. Reduces friction in the engine
6. Helps to prevent rust and corrosion

As a result of these many factors, the specified engine oil must be used and replaced at the specified mileage or time intervals.

Q.12 What is coolant and why it is being used in car?

Ans: PURPOSE OF COOLANT: Coolant is used in the cooling system because it:

1. Transfers heat from the engine to the radiator
2. Protects the engine and the cooling system from rust and corrosion
3. Prevents freezing in cold climates

Coolant is a mixture of antifreeze and water. Water is able to absorb more heat per gallon than any other liquid coolant. Under standard conditions, the following occurs.

Water boils at 212°F (100°C) at sea level.

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Registration No.: .....

School of Automotive Skills

Session: 2019-20 (Summer Semester)

B. Voc. Program, 3rd Semester,

End-Sem. Examination

Course Code: AUT1301 **Time: 2 Hours**

Course Name: Automotive Power Train **Max. Marks: 50**

Instruction:

1. Answer all questions from section A, each question carries one mark.
2. Answer all questions from section B, each question carries four mark.
3. Answer all questions from section C, each question carries six mark.

Section – A

10X01 = 10 Marks

Q. 1 Which of the following does not relate with spark ignition engine.....?

a. Ignition coil
c. Spark plug
b. Distributor
d. **Fuel injector**

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 crown of the piston**
b. The piston walls
d. The piston rings

Q.4 In which condition grease perform better than oils:

a. High bearing load & shock load
c. Temperature extremes
b. Slow journal speed
d. **All the above**

Q.5 Which of the following air-fuel ratio is considered is as rich mixture in spark ignition system?

a. **Below 11:1**
c. Below 20:1
b. Below 15:1
d. Above 20:1

Q.6 A two-stroke cycle engine gives.....the number of power strokes as compared to the four-stroke cycle engine, at the same engine speed.

a. Half
c. Same
b. **Double**
d. Four time

Q.7 The function of oil scraper rings is to....

a. Retain compression
c. **Lubricate cylinder walls**
b. Maintain vacuum
d. Reduce piston wear

Q.8 Two types of oil pumps in automotive engines are use.

a. Gear and piston
c. **Gear and rotor**
b. Rotor and piston
d. Full flow and bypass

Q.9 Which is the most commonly use antifreeze ?

a. Ethyl octane
c. Alcohol
b. Water
d. Ethylene glycol

Q.10 . The maximum temperature in the I.C. engine cylinder is of the order of:

a. 500-1000°C
c. 1500-2000°C
b. 1000-1500°C
d. 2000-2500°C

Section – B

04X04 = 16 Marks

Q.11 Write short note on

a. Engine gasket
b. Engine oil

Q.12 What is coolant and why it is being used in car?

Q.13 Write the difference between mechanical injection and electronic injection system.

Q.14 What is a carburetor and why it is replaced by MPFI system?

Section – C

04X06 = 24 Marks

Q.15 Explain engine lubrication and its components.

Q.16 Explain engine emission control system.

Q.17 Explain fuel supply system for diesel engine.

Q.18 Explain types of carburetor.

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Registration No.: .....

School of Automotive Skills

Session: 2019-20 (Summer Semester)

B. Voc. Program, 3rd Semester,

End-Sem. Examination

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Course Name: Automotive Power Train **Max. Marks: 50**

Instruction:

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2. Answer all questions from section B, each question carries four mark.
3. Answer all questions from section C, each question carries six mark.

Section – A

10X01 = 10 Marks

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c. Gear and rotor
b. Rotor and piston
d. Full flow and bypass

School of Automotive skills

Session: 2019-20 (Summer Semester)

B. Voc. Program, Third Semester,

End-Sem. Examination

Course Code: AUT1304 **Time: 2 Hours**

Course Name: Automotive Refinish Painting **Max. Marks: 50**

Instruction:

1. Answer all questions from section – A, each question carries one mark.
2. Answer all questions from section – B, each question carries Four marks.
3. Answer all questions from section – C, each question carries Six marks.

Section – A

10X01 = 10 Marks

1. Polyester putty is a ...

   a. **2K product**
   c. 1K product
   b. 3K product
   d. None of the above

2. Check putty is a ....

   a. 2K product
   c. **1K product**
   b. 3K product
   d. None of the above

3. What is the width of each layer in feather edging?

   a. **7-10 mm**
   c. 20-30 mm
   b. 0-5 mm
   d. None of these

4. Infrared dryer works on the principle of...

   a. Conduction
   c. Radiation
   b. Convection
   d. All of the above

5. What are the recommended hours for changing floor filters?

   a. **200-250 Hours**
   c. 400 – 450 Hours
   b. 300 – 350 Hours
   d. None of these

6. How many angles are required to inspect the metallic color?

   a. 1
   c. 2
   b. **3**
   d. 5

7. Which of the following are secondary colors?

   a. Red, blue & yellow
   c. Violet, green & blue
   b. **lime, orange & violet**
   d. Red, orange & blue

8. DFT meter is used to measure...

   a. **Thickness of coating**
   c. Gloss of paint
   b. Color quantity
   d. All of the above

9. What is the purpose of dry coat?

a. **To facilitate sanding**
c. a & b
b. To remove dust
d. None of the above

10. The appropriate light for color inspection of a panel is...

a. **Sun light**
c. LED light
b. Sodium light
d. All of the above

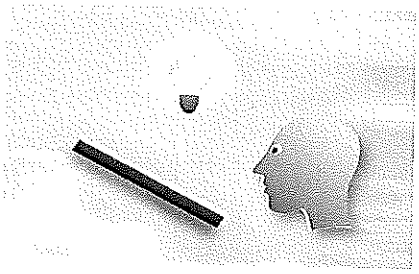
Section – B

04X04 = 16 Marks

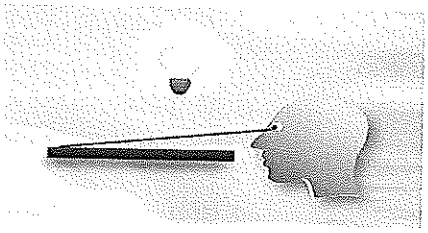
1. What are the different angles used for panel inspection? Explain.

Ans. **Head on: -** Light source is above observer

Near specular :- No reflection of Light source



Side on :- Watch over the surface



2. Explain Hue, Value and Chroma?

Ans. **Hue: -** Hue is the most important property of colour as it simply described by simply names of colour. Colour names like red, blue, yellow etc. all are hue names.

Value: - The attribute with which we can classify color on the basis of their lightness and darkness is called value.

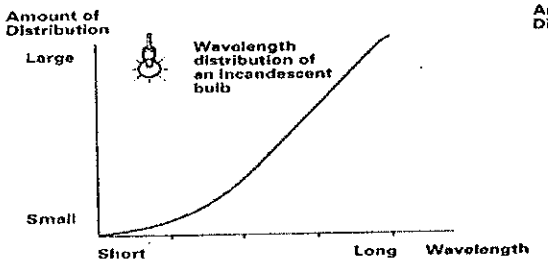
Chroma: - The attribute with which we can classify color on the basis of their Brightness and dullness is called Chroma.

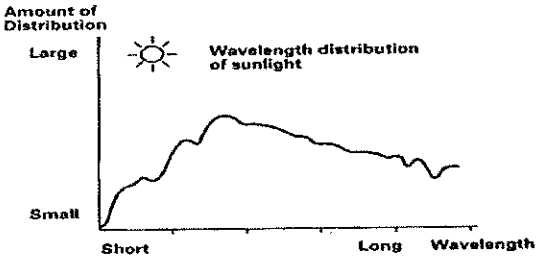
3. What are the differences between body filler and putty?

Ans. Body filler is used when the size of dent is large because the density of body filler is lesser than the putty due to bigger grain size.
Putty is used to finish the layer of body filler and to fill the scratches and small dents as the density of putty is more than body filer due to smaller grain size

4. What is Metamerism?

Ans. Metamerism is the change of colour influenced by another light source (esp. during darkness). Metamerism can be avoided by adjusting colors with their "proper" tinting's.





Section – C

04X06 = 24 Marks

1. Write standard operating procedures for Spot Repair of solid paint.

Ans.

2. Explain any five paint defects with its causes and prevention.

Ans.

- Clouding:

Causes: -

- Incorrect spraying viscosity, spraying technique, flash-off times, spray booth temperature.
- Defective spray gun set up, incorrect spraying pressure.
- Use of unsuitable thinner.
- Solvent popping:

Causes: -

- Insufficient drying of primer filler in corners, edges, and below decorative strips.
- Incorrect choice of hardeners and thinners.
- Film build too high.
- Wrong spraying technique.

- Orange peel

- Unsuitable combination of solvents or low quality solvents.
- Insufficient sanding of substrate.
- Incorrect spray gun set up.
- Excessive temperature.

3. Explain DFT meter, Glossometer, luxometer and viscometer.

Ans. DFT meter: - A coating thickness gauge (also referred to as a paint meter) is used to measure dry film thickness. Dry film thickness is probably the most critical measurement in the coatings industry because of its impact on the coating process, quality and cost.

Glossometer: - A Glossometer (also gloss meter) is an instrument which is used to measure specular reflection gloss of a surface

Luxometer: - The lux (symbol: lx) is the SI derived unit of illuminance and luminous emittance, measuring luminous flux per unit area. It is equal to one lumen per square metre. In photometry, this is used as a measure of the intensity, as perceived by the human eye, of light that hits or passes through a surface

Viscometer: - A viscometer is an instrument used to measure the viscosity of a fluid. For liquids with viscosities which vary with flow conditions, an instrument called a rheometer is used. Thus, a rheometer can be considered as a special type of viscometer. Viscometers only measure under one flow condition.

4. Write standard operating procedure for minor repair of solid paint.

Ans. Steps for Minor Repair:

a. Inspection of defected area
b. Clean with soap and water (Dry)
c. Clean with prepsol degreaser (3919S)
d. Application process: Wipe on and Wipe off Method.
e. Sanding: P-80, P180, P320 (Feather Edging)
f. Putty Application: (759/769 R Polyester putty: 762R Hardener = 100: 1-3% by weight. Apply Guide coat.
g. Putty dry sanding (P80, P180, and P320) (P120, P 220, P320)
h. Blow air/ degreaser with 3920S
i. Process: wipe on wipe off.
j. Primer Surface application: (7701S/4004 fast process). Apply dry guide coat.
k. Dry sanding with P320/ 400
l. Clean with air & degreaser 3920S.
m. Top Coat application.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive skills

Session: 2019-20 (Summer Semester)

B. Voc. Program, 3rd Semester,

End-Sem. Examination

Course Code: AUT 1305 **Time: 2 Hours**

Course Name: Automotive Electrical & Air Conditioning **Max. Marks: 50**

Instruction:

1. Answer all questions from section – A, each question carries one mark.
2. Answer all questions from section – B, each question carries four marks.
3. Answer all questions from section – C, each question carries six marks.

Section – A

10X01 = 10 Marks

1. Which device is used to regulate the Resistance in Electrical circuit?
   a. Resistor.
   b. Capacitor.
   c. Potentiometer.
   d. Transformer.
2. What do we call R-B, Y-B, R-Y in three phase electrical circuits?
   a. Magnetic field lines.
   b. Electric lines.
   c. Phase line.
   d. None of the above.
3. Velocity of streamline flow is called by:
   a. Drift velocity.
   b. Laminar velocity.
   c. Turbulence velocity.
   d. None of the above.
4. What will be the effect on enthalpy while refrigerant is passing through the compressor?
   a. Enthalpy rises.
   b. Enthalpy remains constant.
   c. Enthalpy drops down.
   d. No Effect.
5. No. of primary coils in step down transformer is lesser than the no. of primary coils.
   a. Yes.
   b. No.
6. What will be the direction of current at the end coil to act like a magnetic north pole:
   a. Clockwise.
   b. anticlockwise.
7. Transistors are the combinations of two thyristors.
   a. False.
   b. True.

8. What is the effect of temperature drop on resistor in insulator?
   a. Resistance rises.
   b. Remains same.
   c. Resistance decreases.
   d. None of the above.
9. What is the full form of PZT?
   a. Potassium Zirconium Titanium.
   b. Lead Zirconated Titanate.
   c. Potassium Zirconium Titanate
   d. None of the above.
10. Electrons in an atom around nucleus revolves in ..... path.
   a. Elliptical path
   b. Trapezoidal path
   c. Circular path
   d. None of the above

Section – B

04X04 = 16 Marks

11. What steps should be taken into consideration for measuring current in the electrical circuits?
12. What are the two differences between Entropy and Enthalpy?
13. What do you mean by self-induction? Explain it with the help of diagram.
14. What is Lenz law? Define the generation of magnetic pole in current carrying coil with the help of a diagram.

Section – C

04X06 = 24 Marks

15. Explain the working of VCRS cycle with the help of P-V and T-S diagram.
16. Explain conduction band and valence band with the help of a diagram.
17. How the electrons take part in flow current in electrochemical cells? Explain the role of electrochemical series for electrochemical cells.
18. Explain the working of P-N diodes in forward biased direction on the basis of electron based theory.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

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1. Answer all questions from section – A, each question carries one mark.
2. Answer all questions from section – B, each question carries Four marks.
3. Answer all questions from section – C, each question carries Six marks.

Section – A

10X01 = 10 Marks

1. Which device is used to regulate the voltage in Electrical circuit?
   a. Resistor
   c. potentiometer
   b. capacitor
   d. Transformer
2. Which lines are known as imaginary lines?
   a. Magnetic field lines
   c. Phase line
   b. Electric circuit lines
   d. None of the above
3. Velocity is electrons in electric circuits are called by:
   a. Drift velocity
   c. Turbulence velocity
   b. Laminar velocity
   d. None of the above
4. What will be the effect on entropy while refrigerant is passing through the compressor?
   a. Entropy rises
   c. Entropy drops down
   b. Entropy remains constant
   d. No Effect
5. No. of secondary coils in step up transformer is lesser than the no. of primary coils.
   a. Yes
   b. No
6. What ohms law defined?
   a. Voltage directly proportional to resistance
   c. Current inversely proportional to resistance
   b. Voltage directly proportional to current
   d. None of the above

7. Transistors are the combinations of three diodes.
   a. **False**
   b. True

8. What is the effect of temperature on resistor in Conductor?
   a. **Resistance rises**
   b. Remains same
   c. Resistance decreases
   d. None of the above

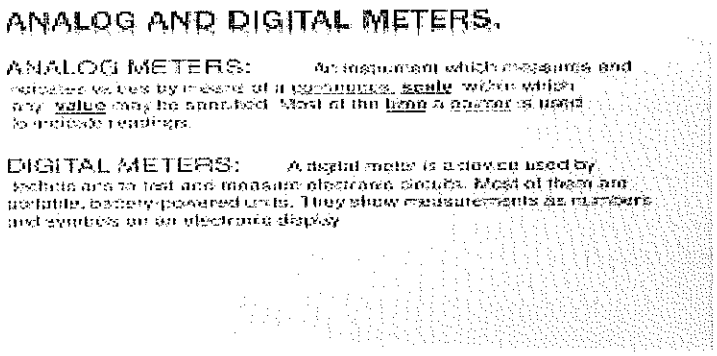
9. What is the full form of PZT?
   a. Potassium zirconium titanium
   b. **Lead zirconate titanate**
   c. Potassium zirconium titanate
   d. None of the above

10. Electrons in an atom around nucleus revolves in ..... Path.
   a. **Elliptical path**
   b. Trapezoidal path
   c. Circular path
   d. None of the above

Section – B

04X04 = 16 Marks

11. What are the differences between Analogue and digital multimeter?


ANALOG AND DIGITAL METERS.

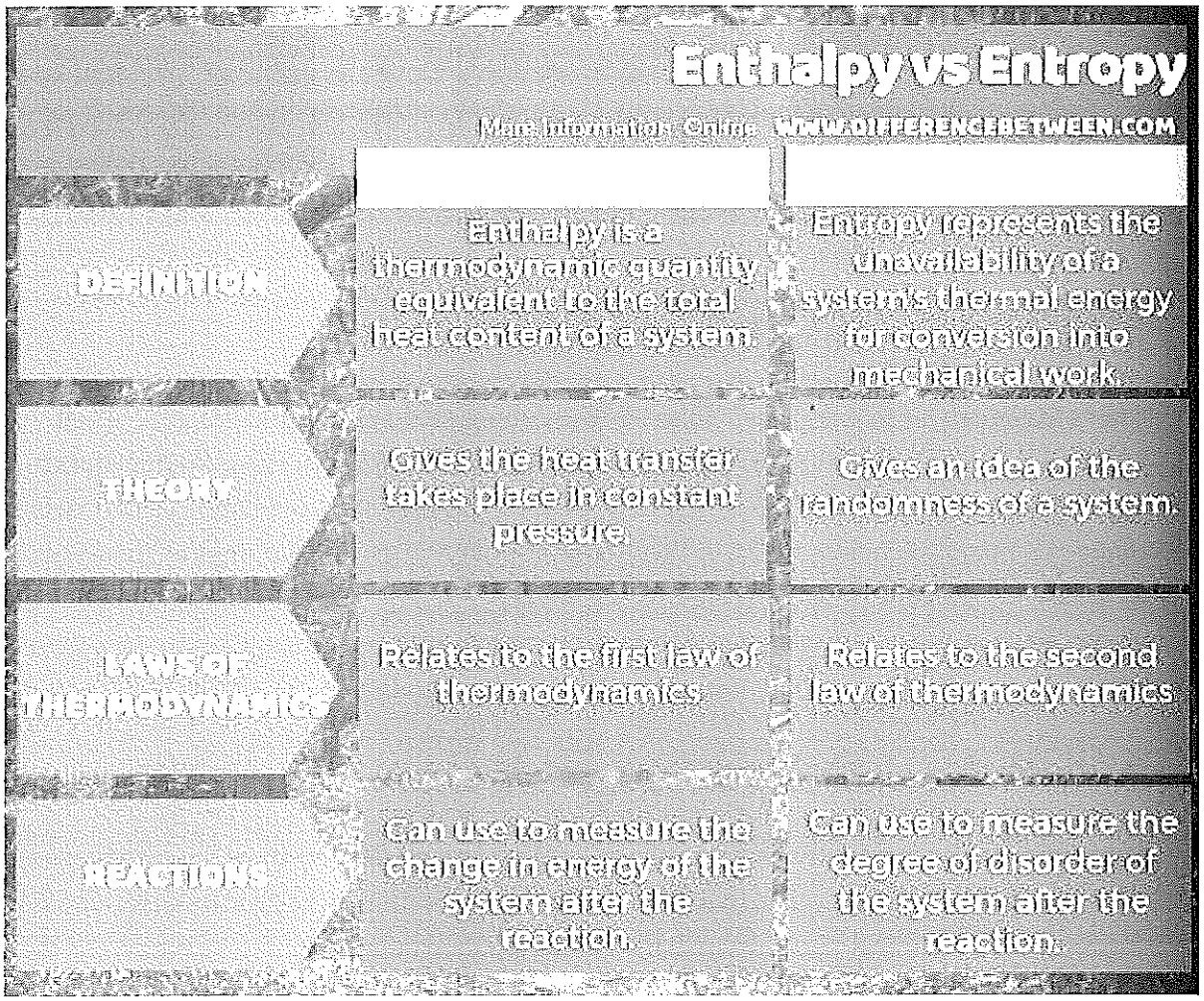
ANALOG METERS: An instrument which measures and indicates values by means of a continuous scale over which any value may be sensed. Most of the time a pointer is used to indicate readings.

DIGITAL METERS: A digital meter is a device used by technicians to test and measure electronic circuits. Most of them are portable, battery-powered units. They show measurements as numbers and symbols on an electronic display.

Ans.

12. What are the two differences between Entropy and Enthalpy?

Ans.

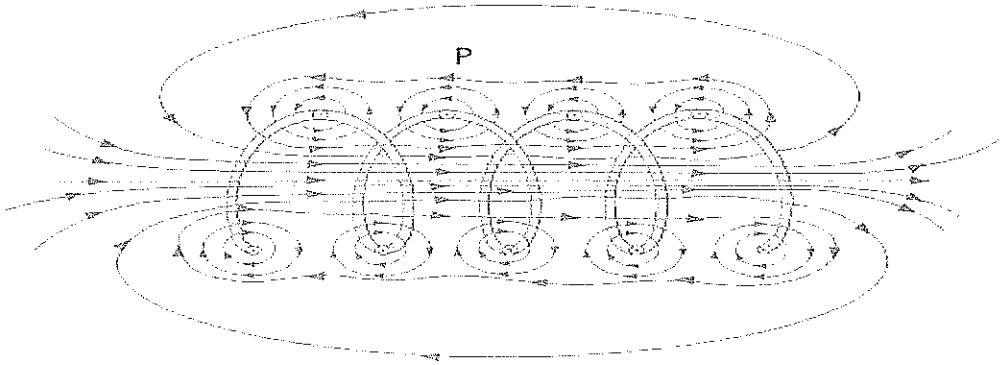


13. What do you mean by open circuit and close circuit in VCRS cycle? Explain it with diagram.

Ans.

14. What do You mean by self-induction? Explain it with diagram.

Ans. Self inductance is defined as the induction of a voltage in a current-carrying wire when the current in the wire itself is changing. In the case of **self-inductance**, the magnetic field created by a changing current in the circuit itself induces a voltage in the same circuit. Therefore, the voltage is self-induced.



Section – C

04X06 = 24 Marks

15. Explain the working of VCRS cycle with the help of P-V and T-S diagram.

Ans. Typical Vapor Compression Refrigeration (**VCR**) **cycle**. Vapor Compression Refrigeration uses mechanical energy by repeating compression and expansion of coolant fluid to achieve cooling by Joule–Thomson effect. ... Vapor compression refrigeration **cycle** is widely used in the air conditioners, heat pumps and HVAC systems.

STEP 1: COMPRESSION

The refrigerant (for example R-717) enters the compressor at low temperature and low pressure. It is in a gaseous state. Here, **compression takes place to raise the temperature and refrigerant pressure**. The refrigerant leaves the compressor and enters to the condenser. Since this process requires work, an electric motor may be used. Compressors themselves can be scroll, screw, centrifugal or reciprocating types.

STEP 2: CONDENSATION

The condenser is essentially a heat exchanger. **Heat is transferred from the refrigerant to a flow of water.** This water goes to a cooling tower for cooling in the case of water-cooled condensation. Note that seawater and air-cooling methods may also play this role. As the refrigerant flows through the condenser, it is in a constant pressure.

One cannot afford to ignore condenser safety and performance. Specifically, pressure control is paramount for safety and efficiency reasons. There are several pressure-controlling devices to take care of this requirement

STEP 3: THROTTLING AND EXPANSION

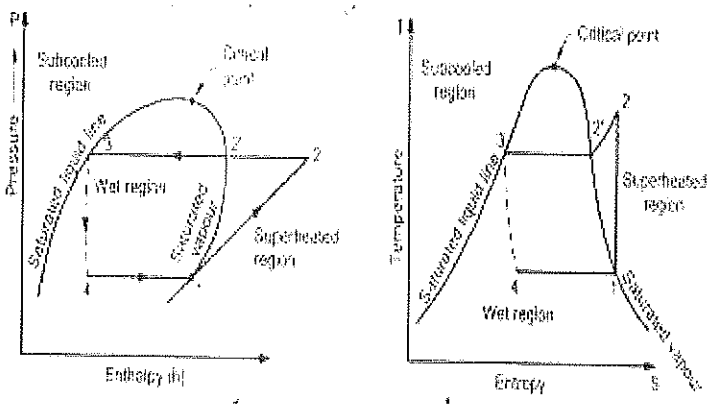
When the refrigerant enters the throttling valve, it expands and releases pressure. **Consequently, the temperature drops at this stage.** Because of these changes, the refrigerant leaves the throttle valve as a liquid vapor mixture, typically in proportions of around 75 % and 25 % respectively.

Throttling valves play two crucial roles in the vapor compression cycle. First, they maintain a pressure differential between low- and high-pressure sides. Second, they control the amount of liquid refrigerant entering the evaporator.

STEP 4: EVAPORATION

At this stage of the Vapor Compression Refrigeration Cycle, the refrigerant is at a lower temperature than its surroundings. Therefore, **it evaporates and absorbs latent heat of vaporization**. Heat extraction from the refrigerant happens at low pressure and temperature. Compressor suction effect helps maintain the low pressure.

There are different evaporator versions in the market, but the major classifications are liquid cooling and air cooling, depending whether they cool liquid or air respectively.



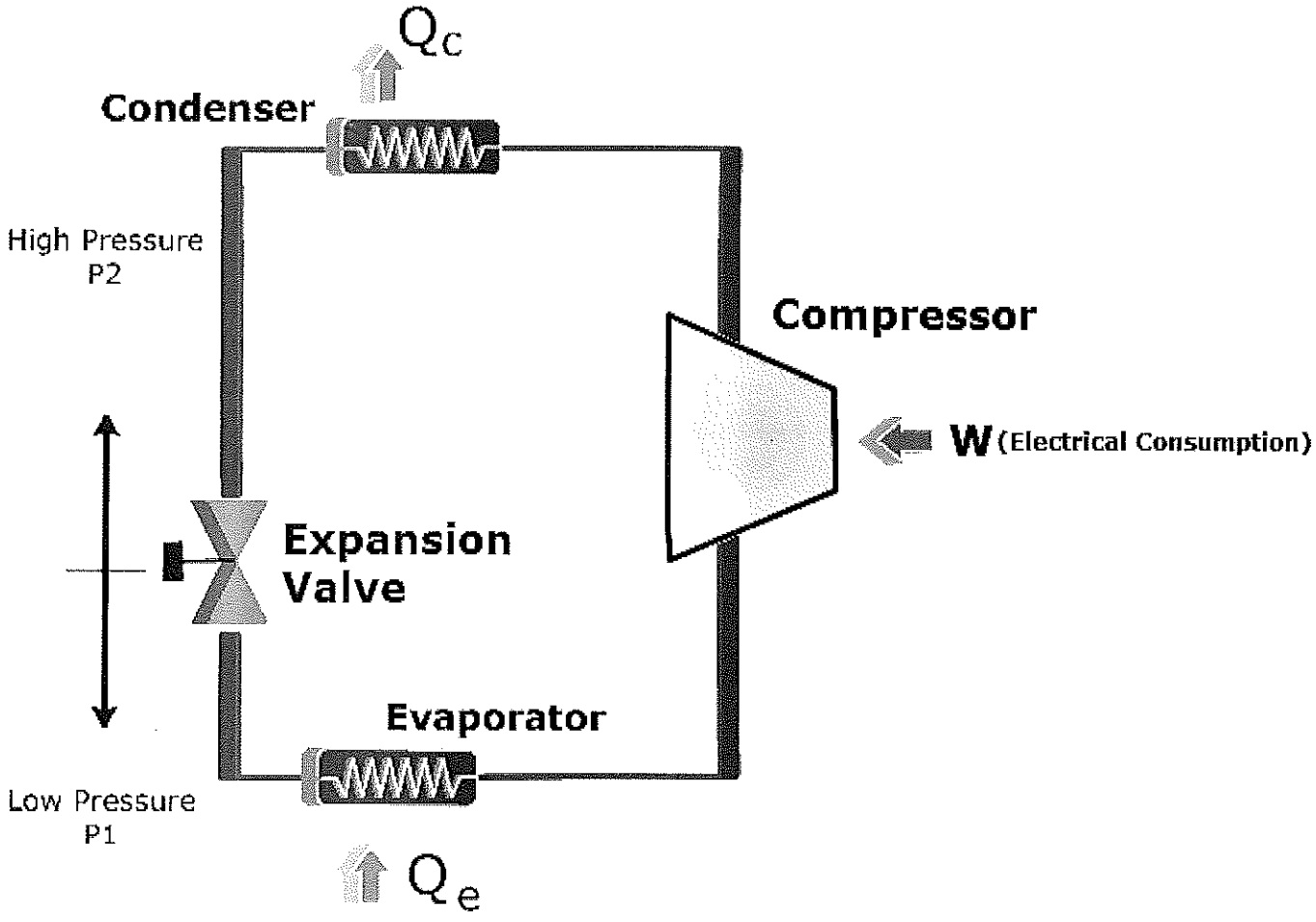
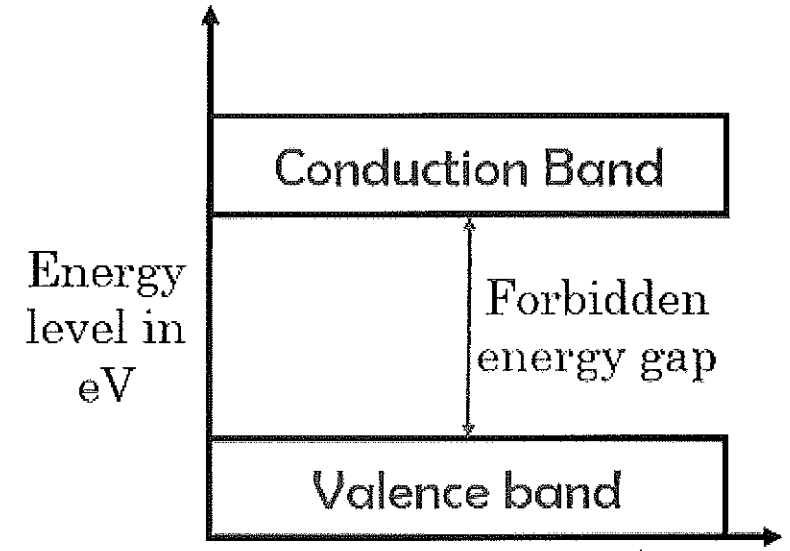


Fig 1: Schematic Representation of the Steps

16. What do You mean by conduction band and valence band? Explain it with diagram.



Energy Band Diagram

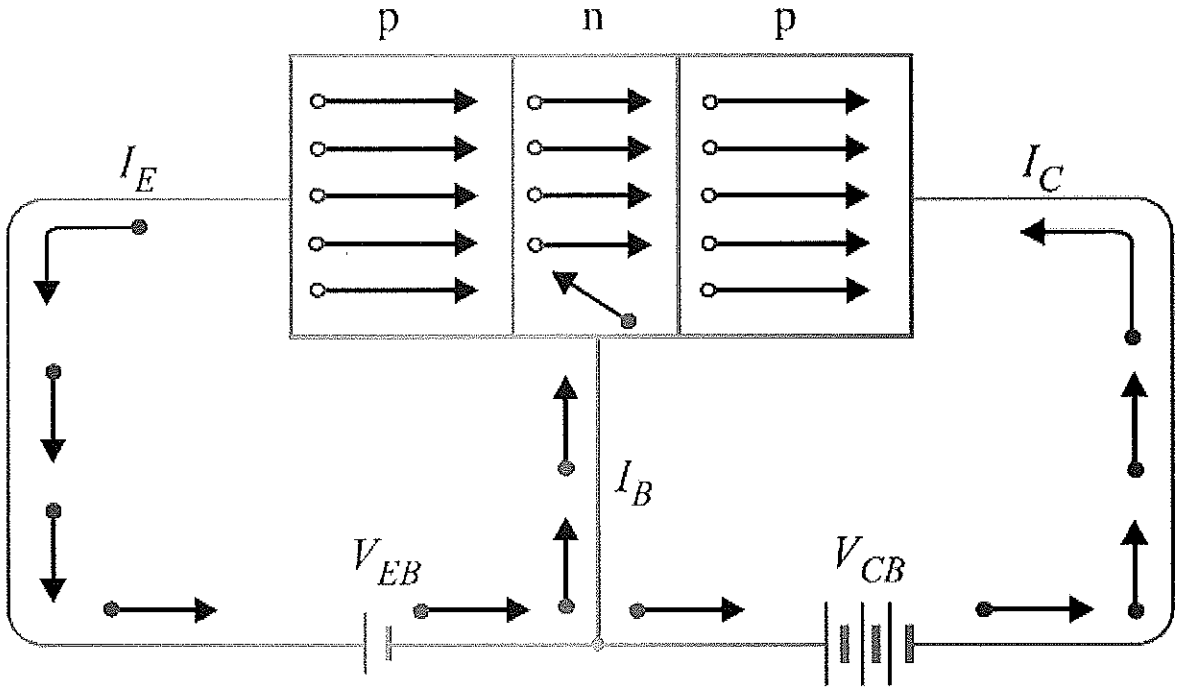
Circuit Globe

Ans.

In non-metals, the **valence band** is the highest range of electron energies in which **electrons** are normally present at absolute zero temperature, while the **conduction band** is the lowest range of vacant electronic states.

17. Explain the working of PNP transistor with diagram.

Ans. The main **working** principle of a **PNP transistor** is, when the current exists at the base of the **PNP transistor**, and then the **transistor** turns OFF. When there is no flow of current at the base of the **transistor**, then the **transistor** switches ON.



Basic connection of *pnp* transistor

18. Explain the working of P-N diodes in forward biased direction on the basis of electron based theory.

Ans. . A **diode** (PN **junction**) in an electrical circuit allows current to flow more easily in one direction than another. Forward biasing means putting a voltage across a **diode** that allows current to flow easily, while reverse biasing means putting a voltage across a **diode** in the opposite direction.

A *P-N junction diode* is a piece of silicon that has two terminals. One of the terminals is doped with P-type material and the other with N-type material. A Semiconductor *diode* facilitates the flow of electrons completely in one direction only – which is the main function of semiconductor *diode*.