THEORY END-SEM EXAMINATION			
SESSION: 2022-23(WINTER SEMESTER)			
B.Voc	**Semester**	3rd	
Course Name / Module	Automotive Power Train II		
Course Code	AUT1301		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTION:

- Maximum Marks: 50
- Duration of Examination: 2 Hours
- Attempt all questions.

1. Section A (10 objective type questions, each question carries 01 mark)	**10×1 = 10**

Q1. _____ is very essential in complete burning of fuel.

a. Hydrogen
b. Oxygen
c. Carbon di-oxide
d. None of the above

Q2. The Turbo Charger is run by _____

a. Exhaust Gases
b. Intake Manifold
c. Engine Crankshaft
d. Drive Belt

Q3. _____ is used in a vehicle to absorb heat and noise generated by the high pressure exhaust gases delivered from the engine

a. Intake System
b. Exhaust System
c. Muffler
d. Tail Pipe

Q4. The Air Volume entering the cylinder is measured by_____

a. Air Valve
b. Intake Manifold
c. Air Cleaner
d. Air Flow Meter

Q5. The exhaust gas from petrol engine contains

a. Petrol vapours
b. Water vapours
c. Carbon monoxide
d. All of these

Q 6. The main function of a resonator is that it

a. Regulates the intake air flow rate
b. Reduces the intake air noise
c. Enhances intake efficiency
d. Regulates the intake air temperature

Q7. The reconditioning process used to give cylinder bore surfaces a crosshatch pattern, is known as

a. Honing
b. Porous plating
c. Boring
d. Shot peening

Q8.Which of the below is not a function of the Engine Management System?

a. Maximum Engine Power & Performance
b. Maximum Braking Performance
c. Lowest Exhaust Emissions
d. Lowest Fuel Consumption

Q9.The Engine Functions are controlled by_____

a. TCM
b. BCM
c. ECU
d. ICU

Q10.The Function of a Sensor is _____

a. To control the component
b. To give output signal to ECU
c. To give ground signal to Component
d. To give input signal to ECU

2. Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

Q11.What do you understand by firing order?
Q12.Write purpose of Air induction system
Q13.Enlist various tools required for engine overhauling
Q14.What is the function of TPS and IAT sensors in EMS

3. Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

Q15.Explain the working of EVAP system used in cars.
Q16.What do you understand by EMS?Expalin its subsystem.
Q17.Explain the exaust system layout
Q18.Explain the procedure of checking pistion and piston rings in Steps.

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B.Voc	**Semester**	3rd	
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c. To give ground signal to Component
d. To give input signal to ECU

2. Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

Q11.What do you understand by firing order?

Ans: Engines cylinders don't fire in the sequence of 1-2-3-4-5-6 and so on. It could cause the crankshaft to deform or break. So, manufacturers shuffle the combustion in such a way that it creates power balance in the engine. The order or sequence in which the engine cylinders fire or generate & deliver power is called the engine firing order.

Firing order in an engine is important because a correct firing order can cause minimum vibrations in the system. Minimum vibration in automobiles is desired as the ride can become smooth and the driver and passengers won't feel the vibrations being transmitted by the engine as it is very less. At the same time, correct firing order can lead to a reduction in overheating and the engine runs cool due to the non-continuous firing of adjacent cylinders

Also firing order helps in proper and easy removal of exhaust gases,which in turn improves the volumetric efficiency of the engine

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Q12.Write purpose of Air induction system

Ans: Following are the Purpose of air induction system

1. Supply the filter air to combustion chamber
2. Meter the amount of air entering.
3. muffles induction noise

Q13.Enlist various tools required for engine overhauling

Ans: Following are the list of tools rwquired

1. Torque wrench
2. Ring compressor
3. Basic set of tools
4. Engine hoist
5. Timing gear Puller
6. Flywheel lock
7. Cam shaft bearing Tool
8. Engine stand etc

Q14.What is the function of TPS and IAT sensors in EMS

Ans: TPS is throtle position sensor,used to indicate exact position of the the throtle to ECM,by which ECM collects the information of quanity of air entered.

IAT is the intake air temprature sensor ,used to detact the temprature of incoming air.On the basis of temprature of Air,ECM decides the condition of air to make correct A/F ratio

3. Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

Q15.Explain the working of EVAP system used in cars.

Ans: Evaporative emissions are raw gasoline vapors that can escape from a vehicle under several different circumstances. Evaporative emissions are in addition to those released from the tail pipe. Gasoline fuel molecules are large and heavy and stay close to the ground. They contribute significantly to urban smog. The whole idea of evaporative emissions controls is to trap these fuel vapors before they can escape to the atmosphere

Working of EVAP :When the engine is shut off, fuel vapors feed on the tank (and float bowl in case of carburetor vehicle) into the charcoal canister.The activated charcoal in the canister traps or adsorbs the fuel vapors.Later when the engine starts, fresh air flows through the canister and picks up gasoline vapor.The air then flows into the intake manifold and becomes part of the air-fuel mixture entering the engine cylinders.This action of clearing the trapped fuel vapor from the canister is called purging.Running the engine removes or purges the vapor from the canister.

Q16.What do you understand by EMS?Expalin its subsystem.

Ans: EMS stands for Engine Management System, consisting of a wide range of electronic and electrical components such as sensors, relays, actuators, and an Engine Control Unit. They work together to provide the Engine Management System with vital data parameters. These are essential for governing various engine functions effectively. Furthermore, modern-day engine technologies incorporate the EMS. These include MPFi & GDi systems in Petrol engines and CRDi systems in diesel engines for improved performance.

ECU stands for Engine Control Unit and ECM for Engine Control Module. Both are the same. However, it is also a generic term for any Electronic Control Unit/Module. The Engine Control Unit is a central part of the Engine Management System, virtually the 'Brain' of the engine. It plays a vital role in collecting, analyzing, processing, and executing the data it receives from various sub-systems. Furthermore, an ECU comprises a computer that uses a microchip to process the inputs from multiple engine sensors in real-time. Furthermore, the Electronic Control Unit contains hardware and software. The ECU's printed circuit board (PCB) consists of a micro-controller chip or the CPU (Central Processing Unit). The micro-controller or chips on the PCB store the software. It is possible to re-program the ECU by updating the software or replacing chips. All the engine sensors send data inputs through electrical signals to the ECU. In turn, the ECU controls various actuators, ignition timing, variable valve timing, etc.

Based on this data input, the ECU precisely calculates and delivers the ideal air-fuel mixture. It also regulates the engine's idle speed and limits the top speed of a vehicle. This system is also widely referred to as an" Electronic Engine Management System" or the EMS. Furthermore, it is possible to customize the modern-day ECUs to suit different vehicular applications and varying customer demands. Also, some cars have an individual' 'Control Module" for all major systems. For example, a modern car has the following individual Control Modules that control the respective systems. An Engine Control Unit connects to all the individual Electronic Control Modules (ECMs). A modern-day car consists of more than one Control Modules, each exclusive for every primary system, which improves performance. However, the manufacturers seldom refer to these systems as car computers since they are multiple computers instead of one.

Q17.Explain the exaust system layout.

Ans: The exhaust system carries the exhaust gases from the engine out into the atmosphere, while dissipating part of the exhaust gas heat to the outside.

Exhaust Manifold: Exhaust manifold is used to vent exhaust gases away from engine. Exhaust manifold collects the exhaust gases from multiple outlet ports in to one pipe.

Muffler: The muffler consists of multiple stages combining the expansion and resonance chambers to absorb heat and noise generated by the high pressure exhaust gases delivered from the engine.

Exhaust Brake unit: Exhaust brake helps in controlling the vehicle speed. It consists of butterfly valve. When Exhaust brake is applied the butterfly valve closes which restricts the flow of exhaust gases. This will create back pressure on piston there, reducing the engine speed as a result reducing the vehicle speed.

Q18.Explain the procedure of checking pistion and piston rings in Steps.

Ans:Following the procedure of checking piston and piston rings

- Pistons should be inspected and measured at several locations including the skirt, top, middle and bottom ring lands and the pin bore.
- The skirt should always be measured exactly 90° from the pin bore.
- The actual height location may vary from manufacturer to manufacturer, but most specify a location the same height as the pin bore location.
- After inspecting the ring lands, check each with a new ring.
- It is important to use new rings for the measuring procedure because wear will reduce the width of the old rings.
- A feeler gauge is placed between the ring and the top of the land.
- Under no circumstances should the ring-to-land clearance exceed .006" (0.15mm). Worn out ring lands do not let the rings seal in the explosive pressures of the burning air-fuel charge.
- It is not advisable to reuse pistons during a rebuild and rings should never be reused.

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INSTRUCTION:

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1. Section A (10 objective type questions, each question carries 01 mark)	**10×1 = 10**

Q 1. The reconditioning process used to give cylinder bore surfaces a crosshatch pattern is known as
a. Honing
b. Porous plating
c. Boring
d. Shot peening

Q2. The materials used for cylinder block are
a. Cast iron and steel
b. Cast iron and aluminum alloy
c. Steel and aluminum alloy
d. Brass and steel.

Q3. The main purpose of an engine's air cleaner is that it
a. Controls the engine's air intake volume
b. Reduces the engine's air intake noise
c. Prevents rain water from entering the engine
d. Prevents dust and other foreign matter from entering the engine

Q4. Which of the following is the main aim of an engine management system to achieve?
a. high reliability and durability with lowest possible initial cost
b. high power output and torque
c. low levels of gaseous and particulate emissions
d. all of the mentioned

Q5. The ignition coil is used to
a. Step up current
b. Step down current
c. Step up voltage
d. Step down voltage

Q6. The self-ignition temperature of Diesel as compared to petrol is

a. Higher
b. Lower
c. Same
d. Depends on fuel quality

Q7.The condition that results in large quantities of HC emission is

a. High temperature combustion
b. Incomplete combustion
c. Low temperature combustion
d. High atmospheric temperature combustion

Q8. What is the firing order of a four-cylinder engine?

a. 1-3-4-2
b. 1-4-3-2
c. 1-2-3-4
d. 4-3-2-1

Q9. The ratio of the actual weight of air induced by the engine in the intake stroke to the theoretical weight of the air that should have been induced due to piston displacement at intake temperature and pressure is known as _____

a. Efficiency-ratio
b. Volumetric-efficiency
c. Mechanical-efficency
d. Thermal-efficiency

Q10.The end of the connecting rod which fits over the gudgeon pin is known as _____ connecting rod.

a. Small-end
b. Big-end
c. Piston
d. Cylinder

2. Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

Q11.Explain the reason of adjusting valve clearance in IC Engine.

Q12.Write purpose of EVAP system used in cars.

Q13.Enlist various types of Air Induction system.

Q14.What is the function of MAP and ECT sensors in EMS

3. Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

Q15.Explain the various components of Air induction system.

Q16.Explain Engine management system in detail.

Q17.Explain the working of 3 way catalitic convertor.

Q18.Explain the procedure of checking of crankshaft and connecting rod bearings.

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2. Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

Q11.Explain the reason of adjusting valve clearance in IC Engine.

Ans: Valve clearance is the gap between the rocker arm and the head of the exhaust and inlet valves. It is provided to mitigate the thermal expansion of the valves. If the tappet clearance isn't appropriate, positive seating of valves is affected leading to leakage and if the clearance is large it could lead to the late opening of the valves. Tappet clearance is measured when the engine is cooled and the piston is at TDC. It is measured using a feller gauge. Suction valve clearance is measured to be 0.35 mm and exhaust valve clearance should be near about 0.45 mm.

It is adjusted by tightening or loosening the lock nut in the rocker's arm

Q12.Write purpose of EVAP system used in cars.

Ans: Evaporative emissions are raw gasoline vapors that can escape from a vehicle under several different circumstances. Evaporative emissions are in addition to those released from the tail pipe.

Gasoline fuel molecules are large and heavy and stay close to the ground. They contribute significantly to urban smog. The whole idea of evaporative emissions controls is to trap these fuel vapors before they can escape to the atmosphere.

Q13.Enlist various types of Air Induction system.

Ans: Following type of air induction system is commonly used in ICE

Cold Air Intake Systems: Cold air intake assemblies feature a longer tube with an air filter positioned on the front end. Because this filter is mounted further away from the engine block itself, it can draw air that's actually cooler in temperature.

Hot Air Intake system: A heated air inlet or warm air intake is a system commonly used on the original air cleaner assemblies of carbureted engine to increase the temperature of the air going into the engine for the purpose of improving the consistency of the air/fuel mixture to reduce engine emissions and fuel usage

Ram Air Intake system: Another method of channeling cooler air into the engine is the "ram air" intake design. In this setup, a longer tube scoops up air from high-pressure areas at the front of the vehicle.

Q14.What is the function of MAP and ECT sensors in EMS

Ans: The function of MAP(Manifold Absolute Pressure) sensor is to measure the absolute pressure of the intake air,with the help of which ECM calculates the mass flow rate of intake air

ECT sensor is the the Engine coolant temprature sensor,which is used to measure the temprature of engine coolant temprature and sends signal to ECM,by which operates cooling fan and make other decission regarding driving condition.

3. Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

Q15.Explain the various components of Air induction system.

Ans: Following are the major components of Air Induction System

Air Cleaner: The air cleaner actually contains an air filter which removes solid particles such as dust, pollen, and mold from air that enters the engine. Air enters the engine through the air intake or air induction system. The grit and dust particles in this air must be removed before it enters the engine. The air cleaner also muffles induction noise.

Throttle body: The amount of air that enters a spark ignition engine is primarily controlled by the driver moving the accelerator pedal. The foot-operated pedal connects through linkage or cable to the throttle valve in the throttle body. This is air-control device for all spark ignition engines.

Depressing the accelerator pedal opens the throttle valve. This allows fresh air from the air cleaner to enter the intake manifold. With a carburetor, the throttle valve controls the amount of air-fuel mixtures that enters

The throttle valve controls only air if the engine has port (multipoint) or throttle body injection.

Instead of a mechanically-operated throttle valve, some cars have an electronic throttle control or drive-by-wire system. A sensor on the accelerator pedal signals its position to the electronic control

module (ECM). The ECM computes the proper opening of the throttle valves. Signals then are sent to small motors on the throttle body which open and close the throttle valves as required.

Intake Manifold: The primary function of the intake manifold is to evenly distribute the combustion mixture (or just air in a direct injection engine) to each intake port in the cylinder head(s). Even distribution is important to optimize the efficiency and performance of the engine. It may also serve as a mount for the carburetor, throttle body, fuel injectors and other components of the engine. The Intake manifold connects to the throttle body with the intake ports in the cylinder head.

The manifold has a set of passages of runners through which air or air-fuel mixture flows. With port fuel injection, only air flows through. Fuel is injected into the air as it flows through the intake ports. With a carburetor or throttle body injection, fuel mixed with the air as it enters the intake manifold.

Q16.Explain Engine management system in detail.

Ans: EMS stands for Engine Management System, consisting of a wide range of electronic and electrical components such as sensors, relays, actuators, and an Engine Control Unit. They work together to provide the Engine Management System with vital data parameters. These are essential for governing various engine functions effectively. Furthermore, modern-day engine technologies incorporate the EMS. These include MPFi & GDi systems in Petrol engines and CRDi systems in diesel engines for improved performance.

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Q17.Explain the working of 3 way catalitic convertor.

Ans: Job of the catalytic converter is to convert harmful pollutants into less harmful emissions before they leave the vehicle's exhaust system.

A catalyst is a substance that causes or accelerates a chemical reaction without itself being affected. Catalysts participate in the reactions, but are neither reactants nor products of the reaction they catalyse. In the catalytic converter, there are two different types of catalyst at work, a reduction catalyst and an oxidation catalyst. Both types consist of a Ceramic Structure or Metallic Structure coated with a metal catalyst, usually platinum, rhodium and/or palladium.

Reduction catalyst is the first stage of the catalytic converter. It uses platinum and rhodium to help reduce the NOx emissions.

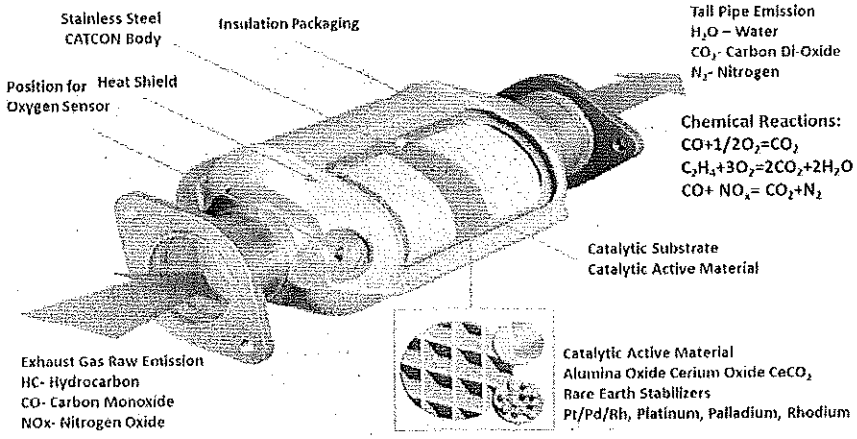
2NO => N**2** + O**2** or 2NO**2** => N**2** + 2O**2** (Nitrogen & Oxygen)

2NO => N**2** + O**2** or 2NO**2** => N**2** + 2O**2**

The oxidation catalyst is the second stage of the catalytic converter. It reduces the unburned hydrocarbons and carbon monoxide.

2CO + O**2** => 2CO**2** (Carbon Dioxide)

HC + O**2** => H2O + CO2



Q18.Explain the procedure of checking of crankshaft and connecting rod bearings.

Ans:The following method is based on the use of gaging plastic:

1) Cut the gaging plastic stock to the required length (equal to the width of the bearing), and place it axially on the journal, avoiding the oil hole.

2) Mount the crankshaft in the usual manner, tightening the bearing caps to the specified torque value. (It is assumed that a gaging plastic piece is pinched at each journal.) Do not rotate the crankshaft when gaging plastic is in.

3) Remove the caps. By referring to the envelop scale, measure the width of the widest part of the piece, and determine whether the radial clearance checked (obtained from the gaging plastic piece) is within the limit.

THEORY END-SEM EXAMINATION			
SESSION: 2022-23(WINTER SEMESTER)			
B.Voc	**Semester**	3rd	
Course Name / Module	Automotive Braking, suspension and steering system		
Course Code	AUT1302		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTION:

- Maximum Marks: 50
- Duration of Examination: 2 Hours
- Attempt all questions.
- Marks will be deducted if overwriting is found in the answer sheet.

1. Section A (10 objective type questions, each question carries 01 mark)	**10×1 = 10**

1. Which of the following is true about tire pressure?
   a) It does not affect fuel effciency
   b) It has no effect on tire lifespan
   c) It should be regularly checked and mantained
   d) It only need adjustment during extreme weather condition

2. When inspecting wheels for damage, Which of the following should technician looked for?
   a) Crack and bends
   b) Loose lug nuts
   c) Tire tread depth
   d) Brake pad wear

3. What does the term tire rotation refer to?
   a) Changing flat tire
   b) Swapping the front and rear tire
   c) balancing the wheels
   d) Aligning the wheels

4. Which of the following is a sign of wheel imbalance?
   a) vibration while driving
   b) increased fuel efficiency
   c) improved steering response
   d) Enhanced tire Grip

5. What is the function of sway bar in suspension system?
   a) To control body role during cornering
   b) To adjust ride height
   c) to provide cushinoning over bumps
   d) to connect wheels to suspension

6. Which component of suspension system is responsible for steering and supporting the weight of the vehicle?
   a) Control arms
   b) Struts
   c) Viscocity cup
   d) None of the above

7. What does the term 'tire tread' refer to?
   a) The inner layer of the tire
   b) outer surface of the tire
   c) sidewall of the tire
   d) Air filled chamber

8. What is the major fault in suspension system if patch wear is found on tire?
   a) Broken swing arm mounting
   b) Bend in linkage rod
   c) Damper leakage
   d) All of the above

9. Which part is crucial for damper leakage?
   a) Coil Spring
   b) Oil seal
   c) Suspension mounting
   d) floating caliper

10. Which of the following is a sign that a tire may need to be replaced?
   a) Even tread wear across the surface
   b) Cracks and bulges on the side wall
   c) tread depth above 10/32 inch
   d) None of the above

2. Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

11. Define the role of Anti roll bar in vehicle.

12. What Do you understand by embeded wire in tires?

13. Differentiate between hydraulic power steering system and Electrical power steering system in terms of efficiency?

14. What do you understand by vulcanisation process?

3. Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

15. Explain the importance of plies in tire. What are the major factors that has to be taken in consideration for understanding about tire ply.

16. Why tire rotation takes place?Explain in detail.

17. What do you understand by rolling, yawing and pitching? Describe cornering forces.

18. Explain any five tire wear pattern and its causes.

THEORY END-SEM EXAMINATION			
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Course Code	AUT1302		
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INSTRUCTION:

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4. Which of the following is a sign of wheel imbalance?
   a) vibration while driving
   b) increased fuel efficiency
   c) improved steering response
   d) Enhanced tire Grip

5. What is the function of sway bar in suspension system?
   a) To control body role during cornering
   b) To adjust ride height
   c) to provide cushinoning over bumps
   d) to connect wheels to suspension

6. Which component of suspension system is responsible for steering and supporting the weight of the vehicle?
   a) Control arms
   b) Struts
   c) Viscocity cup
   d) None of the above

7. What does the term 'tire tread' refer to?
   a) The inner layer of the tire
   b) outer surface of the tire
   c) sidewall of the tire
   d) Air filled chamber

8. What is the major fault in suspension system if patch wear is found on tire?
   a) Broken swing arm mounting
   b) Bend in linkage rod
   c) Damper leakage
   d) All of the above

9. Which part is crucial for damper leakage?
   a) Coil Spring
   b) Oil seal
   c) Suspension mounting
   d) floating caliper

10. Which of the following is a sign that a tire may need to be replaced?
   a) Even tread wear across the surface
   b) Cracks and bulges on the side wall
   c) tread depth above 10/32 inch
   d) None of the above

a) Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

11. Define the role of Anti roll bar in vehicle.

Ans. Sway bars improve a car's handling around turns and corners by controlling the vehicle's weight transfer, including body roll. By working to keep the wheels on each side of the car as even as possible, they help keep the car more planted and maintain a strong contact patch between the tires and the ground. While sway bars are meant to reduce swaying while turning on a corner, it can help improve car handling and stability because it impacts steering and keeps the wheel firm on the ground.

12. What Do you understand by embeded wire in tires?

AnsThe heart of the bead, made up of steel *wire embedded* in rubber. The core ensures that the *tire* sits firmly on the wheel rim. At the innermost part of the tire, you'll find two beads that run across the tire and help it attach to the rim. These beads are made of high-strength steel wires coated in rubber, and they help the tire maintain its shape and pressure. Excessive wear on the inner or outer edge of the tire, known as "toe wear" or, in more extreme cases, as "camber wear," Steel wire is used in the tire belts and beads, and the plies for truck tires. The belts under the tread serve to stiffen the tire casing and improve wear performance and tire handling. The bead wire anchors the tire and locks it onto the wheel.

13. Differentiate between hydraulic power steering system and Electrical power steering system in terms of efficiency?

Ans. This is done so that the car is comfortable and does not feel heavy when used. If the size of the car is getting heavier, then the size of the steering wheel will be bigger to make it easier for the driver to turn. Since the presence of power steering, the weight of the car does not affect anymore. If you're planning to use your vehicle as a road car, then a regular sized steering wheel is likely the right wheel for you. Alternatively, if it's going to be used on a race track, then you might consider a smaller steering wheel for increased comfort

and more room in the racing cockpit. Proponents of the hydraulic assist method highlight one major advantage: the ability to feel the road through the steering wheel. More feedback from the road, or steering feel, creates a more seamless driving experience because the driver can better understand how the car is handling. Hydraulic motors offer superior efficiency, durability, and power versus electric motors.

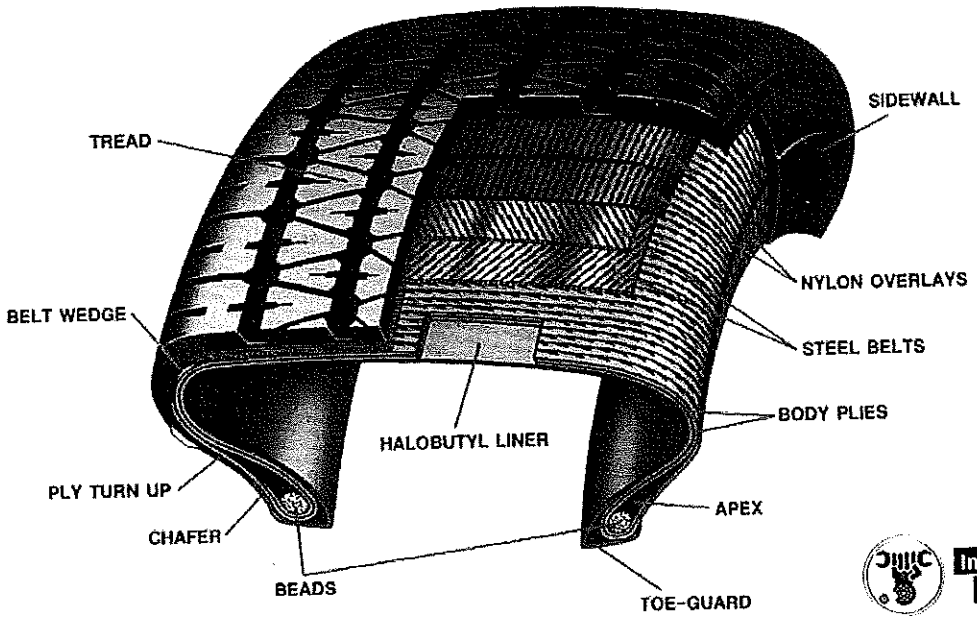
14. What do you understand by vulcanisation process?

Ans. Vulcanization is a chemical process in which the rubber is heated with sulphur, accelerator and activator at 140–160°C. The process involves the formation of cross-links between long rubber molecules so as to achieve improved elasticity, resilience, tensile strength, viscosity, hardness and weather resistance. Vulcanization of rubber is the process of converting natural rubber to more strong and elastic form. Natural rubber is mixed with 3 to 5% sulphur and heated at 100 to 150oC to form cross linking of cis–1,4–polyisopropene chains through disulphide bonds. Vulcanization makes rubber more elastic and stiffer. On vulcanization sulphur forms cross-links at the reactive sites of double bonds or at their reactive allylic position and thus rubber gets stiffened.

b) Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

15. Explain the importance of plies in tire. What are the major factors that has to be taken in consideration for understanding about tire ply.

Ans.



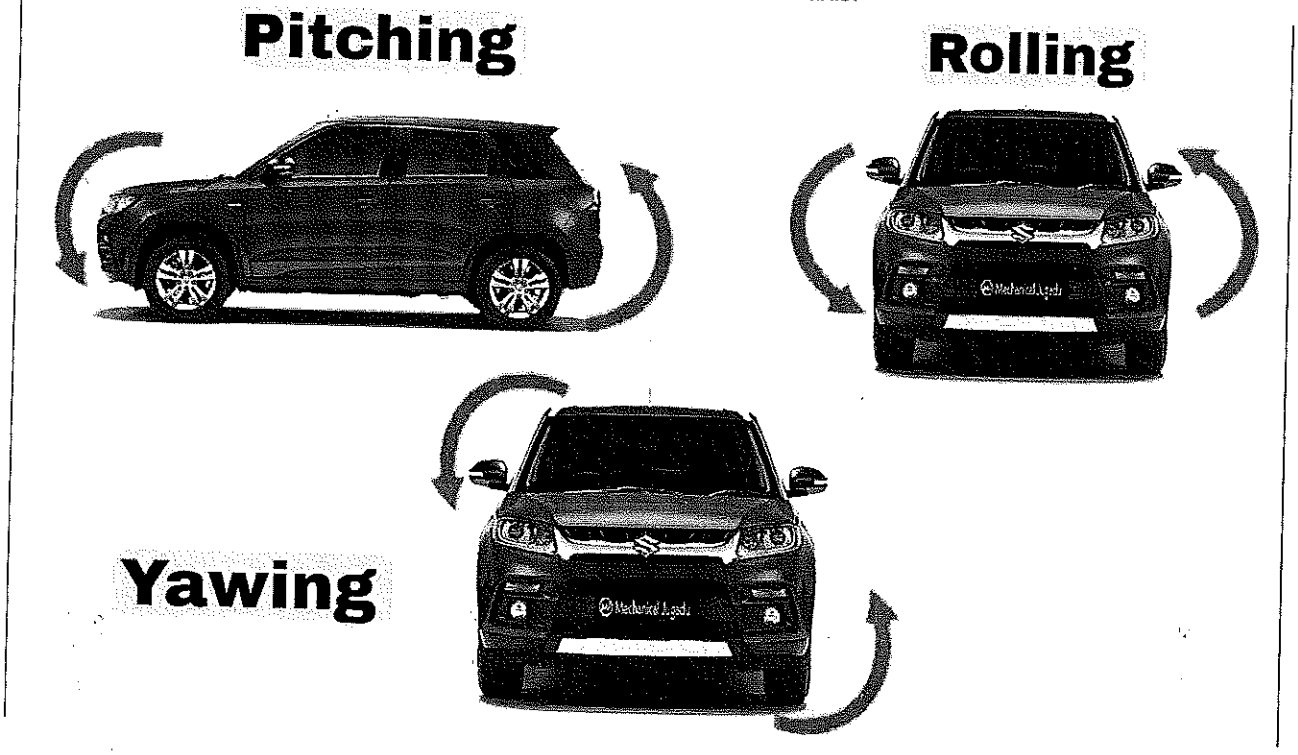
Plies, like polyester cord, run perpendicular to the tire's tread and are coated with rubber to help bond with other plies and belts to seal in air. Plies give tires strength and resistance to road damage. The more ply, the more sidewall strength. When your sidewall isn't strong enough, the load squashes the tires down into the road. The tread then pushes into the ground and spreads out in a way that was never intended by the manufacturer, leading to a blowout. The ply rating translates in a very direct way to tire capabilities and limitations, especially when it comes to inflation and load capacity. If you plan to haul, tow, or carry heavy loads with your vehicle, then understanding the ply rating of your tires is a must.

16. Why tire rotation takes place?Explain in detail.

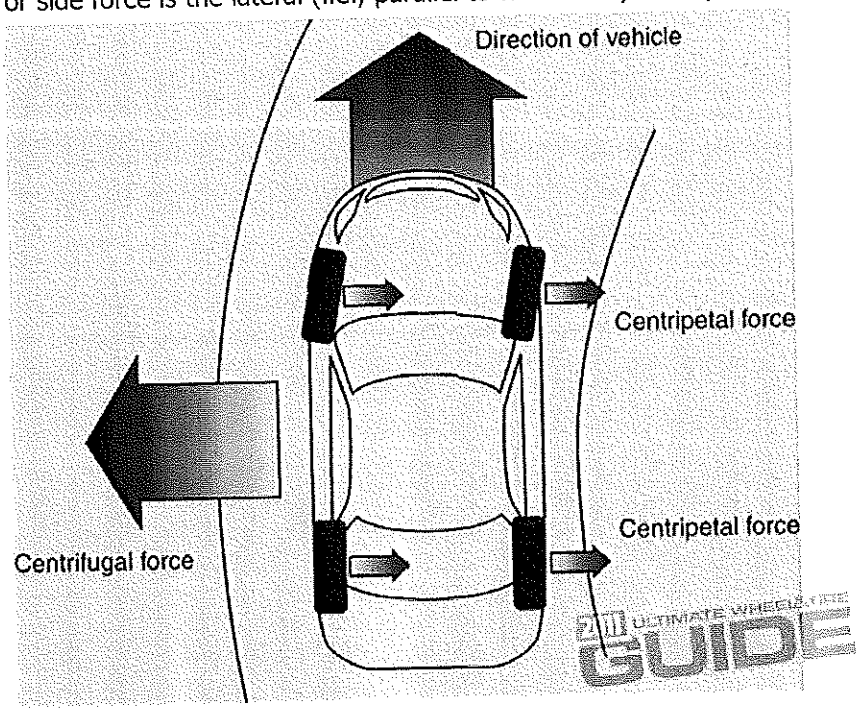
Ans._Most of today's all-wheel drive vehicles recommend that you the replace all four tires at a time because all four wheels need to have the same rolling circumference. If the wheels are not uniform, abnormal drivetrain wear can occur, resulting in costly problems down the road. It is OK to replace 2 tires at a time. If two of your tires wear out faster, it may only be necessary to replace those two instead of replacing all four. If you do, it's important to have the two new tires installed on the back and the partially worn tires moved to the front – even on front-wheel-drive vehicles.
We would always recommend that for optimum safety, drivers should have their newest tyres fitted to the rear of their vehicle. This will ensure that have greater grip on the rear axle and should prevent any potential oversteer or loss of vehicle stability on slippery surfaces

17. What do you understand by rolling, yawing and pitching? Describe cornering forces.

Ans. Pitch is the rotation of a vehicle about the transverse axis. Roll is the rotation of a vehicle about the longitudinal axis. Yaw is the rotation of a vehicle about the vertical axis.



Cornering force or side force is the lateral (i.e., parallel to wheel axis) force produced by a vehicle tire during cornering.



18. Explain any five tire wear pattern and its causes.

Ans. tire wear patterns, like inner and outer wear, center wear, edge wear, cupping, and patchy wear, Uneven tire wear is usually caused by improper alignment, overinflation, underinflation or a worn out suspension. the most common causes of tire failure is underinflation. Tires that are underinflated experience excessive sidewall flexing, which causes them to run dangerously hot, especially at highway speeds during hot weather. The buildup of heat can lead to tread separation or a sudden blowout.

Common causes of tire failure

- Tread separation.
- Tread and steel belt separation.
- Tire made without all specified components.
- Belt and ply losses.
- Improper puncture repair.
- Tire not suitable for vehicle.
- Sidewall failure.
- Retread failure.

tire defects are obvious in some situations, and others are hard to determine with an untrained eye. Below are potential signs of faulty or bad tires to look for.

- Unusual tire vibration
- Uneven tread depth wear
- Cracks or splits in the sidewall
- Blisters or bulges on the tire
- Rapid deflation for no reason
- Lack of traction
- Wobbling of tire
- Tire rim flange markings

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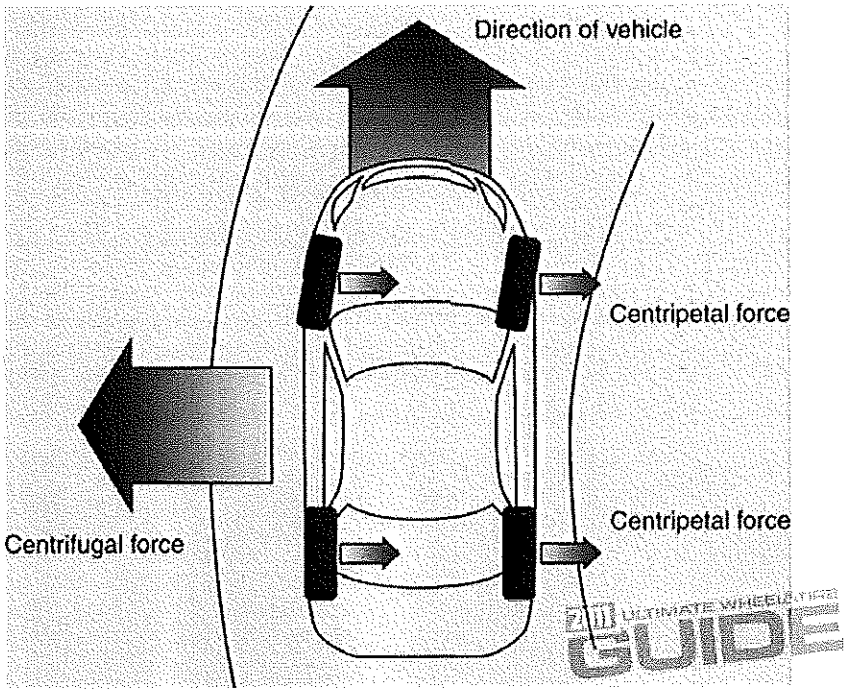

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Common causes of tire failure

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THEORY END-SEM EXAMINATION			
SESSION: 2022-23(WINTER SEMESTER)			
B.Voc	**Semester**	3rd	
Course Name / Module	Automotive Braking, suspension and steering system		
Course Code	AUT1302		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTION:

- Maximum Marks: 50
- Duration of Examination: 2 Hours
- Attempt all questions.
- Marks will be deducted if overwriting is found in the answer sheet.

1. Section A (10 objective type questions, each question carries 01 mark) **10×1 = 10**

1. 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

2. The friction lining on brake shoes or the brake pads is done using:
   a) Bakelite
   b) Asbestos
   c) Silicon
   d) Diamond

3. Which of these are the tire repairing process.
   a) plug installation
   b) cold patch installation
   c) Hot patch installation
   d) All of the above

4. Which of the following component is specially defined to limit the movement in suspension system?
   a) Coil Spring
   b) Leaf spring
   c) Damper
   d) Knuckle

5. How many minimum no. of plies are required for tire manufacturing?
   a) 3
   b) 4
   c) 2
   d) 2.5

6. How do we check the Brake fluid oil?
   a) Moisture %
   b) Fire point
   c) Viscocity cup
   d) None of the above

7. Which part is responsible for flexible behaviour of axle?
   a) Ball joint
   b) C V joint
   c) Bearing
   d) None of the above

8. What is the major fault in suspension system if patch wear is found on tire?
   a) Broken swing arm mounting
   b) Bend in linkage rod
   c) Damper leakage
   d) All of the above

9. Which part is crucial for damper leakage?
   a) Coil Spring
   b) Oil seal
   c) Suspension mounting
   d) floating caliper

10. What will be the effect in steering sytem if Diameter of steering wheel will be reduced?
   a) No. of turns in steering wheel will increase
   b) No. of turns in steering wheel will decrease
   c) More turnig torque is required
   d) Nothing will change

2. Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

11. Define the role of CV joint in axle.

12. What Do you understand by floating caliper and Fixed caliper?

13. Why the Diameter of steering wheel play important role in turning action of steering system?

14. Why we found Additional rubber treads on newly manufacture tires?

3. Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

15. Explain the importance of tire maintainance as wheel care technician. What are the major factors that has to be taken in consideration for tire purchasing and maintenance.

16. What are the reasons behind recommending to replace all the tires at a time?Explain in detail.

17. When you will feel the vibrations on steering wheel? Give the possible reasons behind it.

18. Explain the reason behind conicity of the tires.

THEORY END-SEM EXAMINATION			
SESSION: 2022-23(WINTER SEMESTER)			
B.Voc	B. Voc	**Semester**	3rd
Course Name / Module	Automotive Braking, Suspension & steering System		
Course Code	AUT1302		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTION:

- Maximum Marks: 50
- Duration of Examination: 2 Hours
- Attempt all questions.
- Marks will be deducted if overwriting is found in the answer sheet.

1. Section A (10 objective type questions, each question carries 01 mark) **10×1 = 10**

1. 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

2. The friction lining on brake shoes or the brake pads is done using:
   a) Bakelite
   b) Asbestos
   c) Silicon
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3. Which of these are the tire repairing process.
   a) plug installation
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   b) No. of turns in steering wheel will decrease
   c) More turnig torque is required
   d) Nothing will change

a) Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

11. Define the role of CV joint in axle.

Ans. The CV joints are essential for transferring the torque from the transmission to the drive wheels at a stable speed. CV joints are also responsible for the up-and-down motion of the suspension. In front wheel drive vehicles, CV joints transfer the torque to the front wheels when your vehicle makes a turn.
An axle actually consists of two CV joints. These joints allow the axle to transfer the engine's power to the drive wheels at a constant speed while accommodating any travel conditions, including the up and down motion of the suspension and cornering.

12. What Do you understand by floating caliper and Fixed caliper?

Ans. A fixed caliper is secured rigidly to the axle assembly and has at least two opposing pistons that force the pads against the disc. A sliding or floating caliper has pistons on only one side of the disc. A fixed caliper's operation is simple to understand. A fixed caliper does not move when the brakes are applied. There are pistons on both sides of a fixed caliper. When the brakes are applied, the pistons apply the brake pads on both sides against the rotor. generally made of cast iron or steel which in turn increases weight and heat compared to the aluminum fixed caliper. A heavy weight stops the disc faster than light weight. The other advantage is that the floating caliper can better dissipate heat due to sliding nature and therefore less chances of brake fade.

13. Why the Diameter of steering wheel play important role in turning action of steering system?

Ans. This is done so that the car is comfortable and does not feel heavy when used. If the size of the car is getting heavier, then the size of the steering wheel will be bigger to make it easier for the driver to turn. Since the presence of power steering, the weight of the car does not affect anymore. If you're planning to use your vehicle as a road car, then a regular sized steering wheel is likely the right wheel for you. Alternatively, if it's going to be used on a race track, then you might consider a smaller steering wheel for increased comfort and more room in the racing cockpit.

14. Why we found Additional rubber treads on newly manufacture tires?

Ans. The rubber hairs are created during the manufacturing process. To make a tyre, rubber is injected into a tyre mould and air pressure is used to spread the liquid rubber into all the nooks and crannies. During the application of heat and air, there is a risk of air bubbles forming between the rubber and the mould.To ensure the rubber completely fills the mould, air needs to escape from small pockets. Small vent holes in the tyre mould allows this to happen, forcing the rubber into every orifice. When this happens, tiny bits of rubber also make their way out of the vent hole. These little bits of rubber firm up and remain attached to the tyre once it is removed from the mould.

b) Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

15. Explain the importance of tire maintainance as wheel care technician. What are the major factors that has to be taken in consideration for tire purchasing and maintenance.

Ans. Aspects like grip, tread, rolling resistance and wear should be given due consideration because they'll make a significant impact on overall handling and performance, especially in wet or winter conditions. Most car tires fall into three main types: all-season, summer, and winter. Most people buy all-season tires because it's easier and cheaper than buying one set for the winter and another for summer. All-season car tires deliver a good, well-rounded performance but are never outstanding in any way. The main functions of a vehicle's tires include supporting the vehicle load, transmitting traction and braking forces to the road surface, absorbing road shocks, and changing and maintaining the direction of travel.

16. What are the reasons behind recommending to replace all the tires at a time?Explain in detail.

Ans. Most of today's all-wheel drive vehicles recommend that you the replace all four tires at a time because all four wheels need to have the same rolling circumference. If the wheels are not uniform, abnormal drivetrain wear can occur, resulting in costly problems down the road. Is it OK to replace 2 tires at a time? If two of your tires wear out faster, it may only be necessary to replace those two instead of replacing all four. If you do, it's important to have the two new tires installed on the back and the partially worn tires moved to the front – even on front-wheel-drive vehicles.
We would always recommend that for optimum safety, drivers should have their newest tyres fitted to the rear of their vehicle. This will ensure that have greater grip on the rear axle and should prevent any potential oversteer or loss of vehicle stability on slippery surfaces

17. When you will feel the vibrations on steering wheel? Give the possible reasons behind it.

Ans. Most steering wheel vibration is due to a problem with your car's wheels. For example, the rims may be damaged, or the tyre pressure uneven. These faults are relatively easy to detect. The commonest cause of a steering wheel vibration is the wheels being out of balance.

Bad Wheel Bearings

There's a good chance that you see this reason all over the internet. However, it's just not that common for a vehicle's wheel bearings to go out. Of course, there are exceptions. If you just bounce the right front tire of a pickup truck over the curb every time you do a U-turn, that wheel bearing is much more likely to go bad. If this is the issue, you may notice a shaky steering wheel and the shaking may continue through the rest of the vehicle.

There's A Problem With The Axles

This is another one that we sometimes see being presented on the internet as a more common issue than it really is. Today, most vehicles are front-wheel drive, and that means the axles are half shafts. When these

go bad, you're much more likely to notice a rhythmic ticking when you turn. While you might feel this in your steering wheel, the problem is usually audible long before you start noticing it in the steering wheel or as a shake in the vehicle. However, there are exceptions where a problem with the axles will cause the steering wheel, and even the whole vehicle, to shake. Did you know that your axle is balanced just like your wheels? While an unbalanced axle shaft is more common for rear-wheel drive vehicles, it can cause your steering wheel to shake along with the rest of the vehicle.

Suspension

So, if the bottom half of our list is just about the rare things found on the internet and not typical reasons for a shaky steering wheel, what are the more common problems? Well, the suspension is a more common reason for a shaky steering wheel. This is especially true for vehicles that haven't been brought to an authorized dealership service center for regular maintenance. That's because suspension problems evolve slowly over time, which means you likely won't notice them before the problem is serious enough to make the steering wheel shaky. Things like loose tie rod ends and ball joints will start by making odd, subtle noises when going over bumps. Since these components are responsible for connecting the steering system to the wheels and the wheels to the car, they can cause a variety of issues, including a shaky steering wheel, uneven tire wear, and even a total loss of steering. Fortunately, every visit to an authorized service center like ours includes a multi-point inspection that will catch such problems well before they start shaking things up.

18. Explain the reason behind conicity of the tires.

Ans. Conicity is a parameter based on lateral force behavior. It is the characteristic that describes the tire's tendency to roll like a cone. This tendency affects the steering performance of the vehicle. Tire conicity refers to a problem in a tire when it's made. Sometimes during manufacturing, one of the components becomes misaligned and causes the tire tread rubber to harden in a slight cone shape, rather than the proper cylinder shape. That causes your car to pull to whatever side the defective tire is on. Ply steer changes direction with clockwise or counter-clockwise motion, while conicity does not. Nominally identical radial tires from the same manufacturer will have relatively large, but narrowly distributed, values of ply steer, and relatively small, but broadly distributed, values of conicity.

THEORY END-SEM EXAMINATION			
SESSION: 2022-23(WINTER SEMESTER)			
B.Voc	**Semester**	3rd	
Course Name / Module	Automotive Body Works		
Course Code	AUT1303		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTION:

- Maximum Marks: 50
- Duration of Examination: 2 Hours
- Attempt all questions.

1. Section A (10 objective type questions, each question carries 01 mark)	**10×1 = 10**

Q.1 Which technique is commonly used for removing small dents from a vehicle's body panel without the need for paintwork?

a) Welding
b) Bonding
c) Paintless Dent Repair (PDR)
d) Fiberglass repair

Q.2 Which material is commonly used for replacing damaged or rusted body panels in automotive repairs?

a) Aluminum
b) Steel
c) Fiberglass
d) Plastic

Q.3 The process of replacing a damaged door panel with a new one is called:

a) Panel bonding
b) Panel replacement
c) Door skinning
d) Dent removal

Q.4 Which of the following is NOT a typical step in the dent repair process?

a) Assessing the dent
b) Applying primer and paint
c) Using heat and cold shrinking techniques
d) Inspecting for quality

Q.5 Fiberglass is a composite material made of:

a) Glass fibers and plastic resin
b) Aluminum and plastic resin
c) Carbon fibers and steel
d) Glass fibers and steel

Q.6 Which method is commonly used for repairing large or complex dents that cannot be fixed through paintless dent repair?

a) Panel replacement
b) Heat and cold shrinking
c) Fiberglass repair
d) Bonding

Q.7 Which of the following is a benefit of using fiberglass in automotive body repair?

a) Lightweight and high strength
c) Resistant to corrosion
b) Easy to mold and shape
d) All of the above

Q.8 Which tool is commonly used in fiberglass repair to remove air bubbles and ensure proper adhesion of the fiberglass material?

a) Wire brush
c) Roller or paddle
b) Sandpaper
d) Heat gun

Q.9 What is the purpose of using body filler in the dent repair process?

a) To protect the metal from corrosion
c) To reinforce the damaged area
b) To provide a smooth surface for paint adhesion
d) To remove rusted sections

Q.10 Which of the following is NOT a typical step in the panel replacement process?

a) Removing the damaged panel
c) Applying fiberglass to the panel
b) Preparing the replacement panel
d) Aligning and securing the replacement panel

2. Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

Q.11 What is Fiberglass? Explain with its advantages.
Q.12 What do you understand by Rust repair, explain it in four major stages.
Q.13 Explain the Fender replacement procedure.
Q.14 Explain Dent Removal Procedure.

3. Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

Q.15 Explain the Door skin replacement procedure.
Q.16 Explain the Windsheild replacement procedure.
Q.17 Explain Dolly-off method along with an example.
Q.18 List out the tools along with their application utilised in body shop while working.

THEORY END-SEM EXAMINATION			
SESSION: 2022-23(WINTER SEMESTER)			
B.Voc	**Semester**	3rd	
Course Name / Module	Automotive Body Works		
Course Code	AUT1303		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTION:

- Maximum Marks: 50
- Duration of Examination: 2 Hours
- Attempt all questions.

1. Section A (10 objective type questions, each question carries 01 mark)	**10×1 = 10**

Q.1 Which technique is commonly used for removing small dents from a vehicle's body panel without the need for paintwork?

a) Welding
b) Bonding
c) Paintless Dent Repair (PDR)
d) Fiberglass repair

Answer: c) Paintless Dent Repair (PDR)

Q.2 Which material is commonly used for replacing damaged or rusted body panels in automotive repairs?

a) Aluminum
b) Steel
c) Fiberglass
d) Plastic

Answer: b) Steel

Q.3 The process of replacing a damaged door panel with a new one is called:

a) Panel bonding
b) Panel replacement
c) Door skinning
d) Dent removal

Answer: b) Panel replacement

Q.4 Which of the following is NOT a typical step in the dent repair process?

a) Assessing the dent
b) Applying primer and paint
c) Using heat and cold shrinking techniques
d) Inspecting for quality

Answer: b) Applying primer and paint

Q.5 Fiberglass is a composite material made of:

a) Glass fibers and plastic resin
b) Aluminum and plastic resin
c) Carbon fibers and steel
d) Glass fibers and steel

Answer: a) Glass fibers and plastic resin

Q.6 Which method is commonly used for repairing large or complex dents that cannot be fixed through paintless dent repair?

a) Panel replacement
b) Heat and cold shrinking
c) Fiberglass repair
d) Bonding

Answer: c) Fiberglass repair

Q.7 Which of the following is a benefit of using fiberglass in automotive body repair?

a) Lightweight and high strength
b) Easy to mold and shape
c) Resistant to corrosion
d) All of the above

Answer: d) All of the above

Q.8 Which tool is commonly used in fiberglass repair to remove air bubbles and ensure proper adhesion of the fiberglass material?

a) Wire brush
b) Sandpaper
c) Roller or paddle
d) Heat gun

Answer: c) Roller or paddle

Q.9 What is the purpose of using body filler in the dent repair process?

a) To protect the metal from corrosion
b) To provide a smooth surface for paint adhesion
c) To reinforce the damaged area
d) To remove rusted sections

Answer: b) To provide a smooth surface for paint adhesion

Q.10 Which of the following is NOT a typical step in the panel replacement process?

a) Removing the damaged panel
b) Preparing the replacement panel
c) Applying fiberglass to the panel
d) Aligning and securing the replacement panel

Answer: c) Applying fiberglass to the panel

2. Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

Q.11 What is Fiberglass? Explain with its advantages.

Ans. . Fiberglass is a composite material made up of glass fibers embedded in a polymer matrix, typically a type of resin. It is known for its strength, versatility, and lightweight nature. Here's an explanation of fiberglass along with its advantages:

Fiberglass is created by weaving or layering thin strands of glass fibers together to form a fabric-like material. This fabric is then saturated with a resin, such as polyester or epoxy, which hardens and binds the fibers together, resulting in a strong and durable composite.

Advantages of fiberglass include:

- Strength
- Lightweight
- Corrosion resistance
- Design flexibility

- Electrical insulation
- Thermal insulation
- Resistance to fire
- Cost-effective

Overall, the combination of strength, lightweight, corrosion resistance, design flexibility, and other advantageous properties make fiberglass a versatile material used in a wide range of applications, including construction, automotive, aerospace, marine, electrical, and many others.

Q.12 What do you understand by Rust repair, explain it in four major stages.

Ans. Rust repair is the process of addressing and rectifying the damage caused by corrosion on a vehicle's metal surfaces. Rust, which occurs when iron or steel reacts with oxygen and moisture, can weaken the structural integrity of the vehicle and negatively impact its appearance. Here's an explanation of the four major stages involved in rust repair:

Preparation and Assessment:
The first stage of rust repair involves thoroughly assessing the extent of the rust damage. This includes identifying the affected areas and evaluating the severity of the corrosion. The damaged parts are inspected to determine whether they can be repaired or need to be replaced. Additionally, any loose or flaking rust is removed using tools such as wire brushes or sandpaper to create a clean surface for repair.

Rust Removal:
The second stage involves the actual removal of the rust. This can be accomplished through different methods depending on the severity of the corrosion. For surface rust, mechanical abrasion techniques like sanding or grinding may be used to remove the rusted layers until clean metal is exposed. For more severe rust, chemical rust removers or rust dissolvers can be applied to break down the rust and facilitate its removal. In some cases, parts that are extensively corroded may need to be cut out and replaced with new metal sections.

Surface Preparation and Treatment:
Once the rust has been removed, the affected area is prepared for repair. This involves cleaning the surface to remove any remaining rust particles, dirt, or contaminants. The surface may be sanded or etched to improve adhesion for subsequent steps. Rust converters or rust inhibitors may also be applied to treat the remaining rust or prevent further corrosion. These products help convert any residual rust into a stable surface that can be primed and painted.

Repair, Priming, and Painting:
The final stage of rust repair involves restoring the damaged area to its original condition. This includes repairing any holes, dents, or pits that were caused by the rust. Bondo or body filler may be used to fill and level the surface, followed by sanding and shaping to achieve a smooth finish. Once the repair is complete, a primer is applied to protect the metal from future rust and create a suitable surface for paint adhesion. Finally, the repaired area is painted to match the vehicle's original color, typically using a basecoat and clearcoat system.

Q.13 Explain the Fender replacement procedure.

Ans: The fender replacement procedure involves removing and replacing a damaged fender on a vehicle. The fender is a panel located above the wheel arches that helps protect the vehicle's body and adds to its aesthetic appearance. Here's an overview of the typical steps involved in the fender replacement process:

Preparation and Assessment:

Begin by assessing the extent of the damage to the fender and determining if a replacement is necessary. Inspect the fender for dents, scratches, rust, or any other signs of damage. Evaluate the surrounding areas for any additional damage that may have occurred. Once it's determined that a replacement is required, gather the necessary tools and materials for the procedure.

Removal of the Damaged Fender:

To remove the damaged fender, start by disconnecting any components that are attached to it, such as side markers, trim pieces, or turn signals. Use appropriate tools, such as wrenches or screwdrivers, to remove bolts, screws, or clips holding the fender in place. Carefully detach the fender from the vehicle, taking note of any electrical connections or wiring that may need to be disconnected.

Preparing the Replacement Fender:

Before installing the new fender, prepare it for installation. This involves checking the fit and alignment of the replacement fender to ensure it matches the vehicle's specifications. Make any necessary adjustments to ensure proper alignment with adjacent panels and the wheel well. Additionally, inspect the replacement fender for any defects or imperfections that may require repair or touch-up before installation.

Installation of the Replacement Fender:

Once the replacement fender is prepared, it's time to install it onto the vehicle. Begin by aligning the new fender with the mounting points on the body of the vehicle. Carefully position the fender in place, ensuring that it lines up with adjacent panels and the wheel well. Reattach any electrical connections or wiring that were disconnected during the removal process. Secure the fender in place using the appropriate bolts, screws, or clips, following the manufacturer's specifications and guidelines.

Finishing and Paintwork:

After the replacement fender is securely installed, inspect the entire assembly for proper fit and alignment. Make any necessary adjustments to ensure a seamless appearance. Once satisfied with the fit, the fender may require additional finishing work, such as sanding, priming, and painting, to match the vehicle's color and finish. Apply a primer to the fender to ensure proper paint adhesion, followed by the application of basecoat and clearcoat to achieve a uniform finish.

Quality Inspection:

Conduct a thorough quality inspection of the replacement fender and the surrounding areas. Check for proper fit, alignment, and finish. Ensure that all connections, fasteners, and components are properly secured. Address any issues or imperfections to ensure a satisfactory and durable fender replacement.

Q.14 Explain Dent Removal Procedure.

Ans. The dent removal procedure, also known as paintless dent repair (PDR), is a technique used to remove minor dents from a vehicle's body without the need for traditional bodywork and painting. It is a non-invasive method that preserves the original paint finish and can be more cost-effective compared to conventional dent repair. Here's an overview of the typical steps involved in the dent removal procedure:

Assessment:
Begin by assessing the dent to determine if it is suitable for paintless dent repair. PDR is most effective for small, shallow dents that have not damaged the paint or caused the metal to stretch. Evaluate the size, depth, and location of the dent to determine if it can be repaired using PDR techniques. If the dent is too large or the paint is damaged, traditional dent repair methods may be necessary.

Gain Access to the Dent:
To access the backside of the dent, it may be necessary to remove interior panels, trim pieces, or access points. This allows the technician to reach the dent from behind and apply the necessary tools and techniques to repair it. Carefully remove any components or panels required for access, following manufacturer guidelines and using appropriate tools.

Dent Manipulation:
Using specialized tools, such as metal rods or picks, the technician gently massages and pushes on the backside of the dent. This process is done incrementally, applying pressure and strategically manipulating the metal to slowly reshape it back to its original form. The technician may use different techniques, such as pushing, tapping, or applying pressure at specific points, to gradually work out the dent.

Reflection and Lighting:
During the dent removal process, reflective boards or lighting aids are used to assess the progress and ensure a precise repair. These tools help the technician see the subtle changes in the metal's surface and identify any remaining imperfections. By carefully examining the reflection and shadows, the technician can make precise adjustments and continue manipulating the dent until it is fully repaired.

Finishing Touches:
Once the dent is successfully removed, the technician performs final inspections to ensure the repair meets the desired outcome. This involves checking for any remaining imperfections, such as high spots or ripples, and making necessary adjustments. The repaired area is carefully inspected from different angles and lighting conditions to ensure a seamless result.

Reassembly:
After the dent removal process is complete, any interior panels, trim pieces, or access points that were removed for access are reinstalled. The reassembly is done meticulously to ensure proper alignment, fit, and functionality of all components.

Quality Inspection:
Conduct a thorough quality inspection of the repaired area and the surrounding panels. Ensure that the dent has been completely removed and the surface is smooth and free from any visible signs of repair. Check for proper panel alignment and paint integrity. Address any issues or imperfections to ensure a satisfactory and durable repair.

3. **Section C** (04 long type questions, each question carries 06 marks)	**04×06 = 24**

Q.15 Explain the Door skin replacement procedure.

Ans. The door skin replacement procedure involves removing and replacing the outer metal panel, known as the door skin, on a vehicle's door. This procedure is typically performed when the door skin is damaged, dented, or rusted beyond repair. Here's an overview of the typical steps involved in the door skin replacement process:

Assessment and Preparation:
Begin by assessing the extent of the damage to the door skin and determining if a replacement is necessary. Inspect the door for dents, scratches, rust, or any other signs of damage. Evaluate the condition of the inner structure of the door to ensure it is not compromised. Once it's determined that a replacement is required, gather the necessary tools and materials for the procedure.

Removal of the Damaged Door Skin:
To remove the damaged door skin, start by disconnecting any components that are attached to the door, such as handles, mirrors, or trim pieces. Carefully remove the inner door panel by releasing the retaining clips or screws holding it in place. Once the inner panel is removed, you will have access to the door skin. Use appropriate tools, such as spot weld cutters or drills, to detach the door skin from the door frame. Take caution not to damage the inner structure of the door during this process.

Preparing the Replacement Door Skin:
Before installing the new door skin, prepare it for installation. This involves checking the fit and alignment of the replacement door skin to ensure it matches the dimensions and contours of the original door. Make any necessary adjustments to ensure proper alignment with the door frame and adjacent panels. Additionally, inspect the replacement door skin for any defects or imperfections that may require repair or touch-up before installation.

Installation of the Replacement Door Skin:
Once the replacement door skin is prepared, it's time to install it onto the door frame. Begin by positioning the new door skin onto the frame and aligning it with the mounting points and edges of the door. Secure the door skin in place using appropriate welding or bonding techniques, following the manufacturer's specifications and guidelines. Ensure that the door skin is securely attached and properly aligned with adjacent panels.

Finishing and Painting:
After the replacement door skin is securely installed, inspect the entire assembly for proper fit and alignment. Make any necessary adjustments to ensure a seamless appearance. Once satisfied with the fit, the door may require additional finishing work, such as sanding, priming, and painting, to match the vehicle's color and finish. Apply a primer to the door skin to ensure proper paint adhesion, followed by the application of basecoat and clearcoat to achieve a uniform finish.

Reassembly:
After the door skin replacement is complete, reassemble the components that were removed during the initial disassembly. This includes reinstalling the inner door panel, handles, mirrors, and trim pieces. Ensure that all connections, fasteners, and components are properly secured and functioning as intended.

Quality Inspection:
Conduct a thorough quality inspection of the replaced door skin and the surrounding areas. Check for proper fit, alignment, and finish. Ensure that all components are functioning correctly and that the door operates smoothly. Address any issues or imperfections to ensure a satisfactory and durable door skin replacement.

Q.16 Explain the Windsheild replacement procedure.

Ans. The windshield replacement procedure involves removing and replacing a damaged or cracked windshield on a vehicle. The windshield is a critical component that provides structural support and protects occupants from debris and wind while driving. Here's an overview of the typical steps involved in the windshield replacement process:

Assessment and Preparation:
Begin by assessing the damage to the windshield and determining if a replacement is necessary. Inspect the windshield for cracks, chips, or any other signs of damage that may compromise its integrity. Measure the size of the damaged area and determine if it can be repaired or requires a full windshield replacement. Once it's determined that a replacement is required, gather the necessary tools and materials for the procedure.

Interior and Exterior Preparation:
To access the windshield, it may be necessary to remove interior components or panels. Carefully remove items such as rearview mirrors, sun visors, or moldings that may obstruct the windshield's removal. If there are any electrical connections, such as defroster or rain sensor wires, disconnect them as well. On the exterior, use protective covers or tape to shield the surrounding areas of the vehicle from any potential damage during the replacement process.

Removal of the Damaged Windshield:
To remove the damaged windshield, a technician typically uses specialized tools, such as a windshield removal tool or piano wire. The tool is inserted between the windshield and the body of the vehicle, gradually cutting through the adhesive that holds the windshield in place. The technician carefully applies pressure and maneuvers the tool along the edges of the windshield to detach it from the vehicle. It's important to exercise caution during this step to avoid any damage to the vehicle or the technician.

Surface Preparation:
After the old windshield is removed, the surface area where the new windshield will be installed needs to be properly prepared. This involves thoroughly cleaning the windshield frame to remove any debris, old adhesive, or residue. The frame may also require priming or other treatments to ensure proper adhesion of the new windshield.

Installation of the New Windshield:
Once the surface is prepared, the new windshield is carefully positioned and aligned with the windshield frame. A professional-grade adhesive, specifically designed for windshield installation, is applied to the frame. The windshield is then gently pressed into place, ensuring it fits snugly and is centered properly. The adhesive is left to cure, following the manufacturer's recommended time, to ensure a secure bond between the windshield and the vehicle's frame.

Reassembly and Clean-up:

After the new windshield is securely installed, reattach any interior components that were removed earlier, such as rearview mirrors, sun visors, and moldings. Reconnect any electrical connections, such as defroster or rain sensor wires. Perform a thorough clean-up of the vehicle's interior and exterior, removing any debris or adhesive residue that may have been left behind during the replacement process.

Quality Inspection:
Conduct a thorough quality inspection of the replaced windshield and its surrounding areas. Check for proper fit, alignment, and sealing. Ensure that the windshield is free from any visible defects or distortions that may affect visibility. Test the functionality of any connected electrical components, such as defrosters or rain sensors. Address any issues or imperfections to ensure a satisfactory and durable windshield replacement.

Q.17 Explain Dolly-off method along with an example.

Ans. The "dolly off" method is a technique used in automotive body repair to remove dents and reshape metal panels. It involves using a dolly, which is a handheld metal tool with a flat or curved surface, to support the backside of the damaged panel while applying pressure to the front side with a hammer or another shaping tool. This method helps reshape the metal and restore it to its original form. Here's an overview of how the dolly off method is typically used:

Assessment:
Begin by assessing the dent or damaged area on the metal panel. Determine if the dolly off method is suitable for the specific type of dent or damage. This method is typically effective for shallow or moderate dents that have not caused the metal to stretch or tear.

Selecting the Dolly:
Choose an appropriate dolly for the specific repair. Dollies come in various shapes and sizes, including flat, round, or curved surfaces, to match the contour of the panel being repaired. The dolly should be slightly larger than the damaged area to provide adequate support and distribution of pressure.

Positioning the Dolly:
Place the dolly on the backside of the damaged panel, directly behind the dent. The dolly should be positioned to support the metal directly under the damaged area. Hold the dolly firmly against the metal panel, ensuring it makes good contact and provides a solid backing.

Hammering Technique:
Using a hammer or another shaping tool, apply controlled and precise strikes to the front side of the damaged panel. The hammer should be used to strike the metal around the dent, gradually working from the outer edges toward the center. The strikes should be firm but not excessive to avoid creating new dents or stretching the metal further.

Applying Pressure and Shaping:
While hammering, apply consistent pressure on the dolly with your other hand. This pressure helps support the metal and acts as a counterforce to the hammering action, allowing for controlled reshaping. The pressure on the dolly should be evenly distributed to prevent creating uneven surfaces or additional dents.

Continuous Assessment and Adjustments:

Continuously assess the progress of the repair as you work. Examine the front side of the panel to monitor the dent's reduction and the panel's overall shape. Make any necessary adjustments to the position and angle of the dolly, as well as the hammering technique, to ensure the desired outcome.

Finishing Touches:
Once the dent is sufficiently reduced and the panel is reshaped, use additional tools, such as body files or sandpaper, to smooth out any remaining imperfections. This helps achieve a uniform surface and prepares the panel for further refinishing or painting if necessary.

Q.18 List out the tools along with their application utilised in body shop while working.
Ans.
Here is a list of commonly used tools in a body shop and their applications:

Air Compressor: Provides compressed air for various pneumatic tools used in a body shop, such as paint sprayers, sanders, and impact wrenches.

Paint Spray Gun: Used to apply primer, basecoat, clearcoat, and other types of automotive paint to the vehicle's body panels.

Dent Puller/Slide Hammer: Helps remove larger dents by providing pulling force to the damaged area.

Body Filler and Spreader: Used to fill in small dents, scratches, and imperfections on the vehicle's body before priming and painting.

Sandpaper/Sanding Blocks: Used for smoothing and preparing surfaces before painting or refinishing.

Welding Machine: Enables the joining of metal panels or components using welding techniques like MIG (Metal Inert Gas) or TIG (Tungsten Inert Gas) welding.

Dent Repair Tools (PDR Tools): Includes various specialized tools like dent rods, picks, and hooks used for paintless dent repair to remove smaller dents without damaging the paint.

Panel Beating Hammers and Dollies: Used in combination to reshape metal panels, remove dents, and smooth out damaged areas.

Body Measuring System: Allows precise measurement and alignment of the vehicle's structure and panels to ensure proper fit and alignment during repairs.

Frame Straightening Equipment: Used to correct and realign the vehicle's frame or unibody structure after a collision.

Spray Booth: A controlled environment with proper ventilation used for painting and refinishing vehicles, ensuring a clean and dust-free finish.

Dent Pulling System: Utilizes specialized tools, such as glue tabs and dent pulling machines, to remove dents by applying controlled pulling force.

Paint Mixing System: Used to mix automotive paint colors accurately, ensuring consistent color matching for repairs.

Impact Wrench: A pneumatic tool used for fastening or removing bolts and nuts with high torque.

Grinder/Cut-Off Tool: Used for cutting metal, grinding, and smoothing surfaces during various repair processes.

Body Panel Removal Tools: Assists in safely removing interior and exterior panels without damaging them or the surrounding components.

Heat Gun: Provides controlled heat for tasks such as paint drying, vinyl wrapping, or paint removal.

Sanding/Polishing Machine: Powered tool used for sanding, smoothing, and polishing surfaces to achieve a smooth and glossy finish.

Body Straightening Clamps and Chains: Used to hold and secure the vehicle's body during frame straightening or pulling operations.

Body Seam Sealer Gun: Used for applying sealants to joints and seams to prevent water or air leakage.

THEORY END-SEM EXAMINATION			
SESSION: 2022-23(WINTER SEMESTER)			
B.Voc	**Semester**	3rd	
Course Name / Module	Automotive Body Works		
Course Code	AUT1303		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTION:

- Maximum Marks: 50
- Duration of Examination: 2 Hours
- Attempt all questions.

1. Section A (10 objective type questions, each question carries 01 mark)	**10×1 = 10**

Q.1: Which of the following tools is commonly used to remove paint and rust from a vehicle's body?

A) Hammer
B) Screwdriver
C) Wire brush
D) Pliers

Q.2: What is the purpose of a body filler in the repair process?

A) To create a smooth surface for painting
B) To strengthen the damaged area
C) To prevent further rusting
D) To restore the structural integrity of the vehicle

Q.3: Which of the following is NOT a common method for repairing a scratched or damaged clear coat on a vehicle?

A) Sanding and buffing
B) Applying touch-up paint
C) Using a paintless dent repair technique
D) Spray painting the affected area

Q.4: When repairing a damaged body panel, which of the following is typically the first step?

A) Removing any trim or moldings
B) Sanding the damaged area
C) Applying primer to the repaired area
D) Welding the panel back together

Q.5: What is the purpose of applying primer to a repaired body panel?

A) To protect the panel from corrosion
B) To provide a smooth base for paint adhesion
C) To strengthen the repaired area
D) To fill in any remaining dents or scratches

Q.6: Which of the following is a common method used to repair a small dent in a vehicle's body?

A) Heat the damaged area to reshape it
B) Apply a layer of body filler
C) Sandblast the affected area
D) Replace the entire body panel

Q.7: What is the purpose of using Panel Adhesive during the body repair process?

A) To Adjoin two panels using adhesive
B) To remove any dust or debris from the panel
C) To seal off the panel from the outer environment
D) To protect the vehicle from harsh weather conditions

Q.8: Which of the following is NOT a common step in the process of repainting a vehicle?

A) Applying a clear coat
B) Sanding the old paint off completely
C) Taping off areas that should not be painted
D) Applying a base coat of color

Q.9: What is the purpose of Sanding and buffing during the paint refinishing process?

A) To remove any imperfections and create a smooth surface
B) Apply a protective layer of wax on the paint
C) To speed up the drying process of the paint
D) To remove the clear coat and expose the base coat

Q.10 Which of the following is a common method used to repair cuts in a vehicle's body?

A) Sandblasting
B) Welding
C) filler application
D) Clear coat application

2. Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

Q.11 Explain Fiberglass along with its advantages.
Q.12 What do you understand by collision repair, explain it in four major stages.
Q.13 Explain the back door replacement procedure.
Q.14 Explain Rust Removal Procedure.

3. Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

Q.15 Explain the door skin replacement procedure.
Q.16 Explain the dent removal procedure.
Q.17 Explain Dolly-on method along with an example.
Q.18 List out the safety precautions we should take while working in a body shop.

THEORY END-SEM EXAMINATION			
SESSION: 2022-23(WINTER SEMESTER)			
B.Voc	**Semester**	3rd	
Course Name / Module	Automotive Body Works		
Course Code	AUT1303		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTION:

- Maximum Marks: 50
- Duration of Examination: 2 Hours
- Attempt all questions.

1. Section A (10 objective type questions, each question carries 01 mark)	**10×1 = 10**

Q.1: Which of the following tools is commonly used to remove paint and rust from a vehicle's body?

A) Hammer
B) Screwdriver
C) Wire brush
D) Pliers

Answer: C) Wire brush

Q.2: What is the purpose of a body filler in the repair process?

A) To create a smooth surface for painting
B) To strengthen the damaged area
C) To prevent further rusting
D) To restore the structural integrity of the vehicle

Answer: A) To create a smooth surface for painting

Q.3: Which of the following is NOT a common method for repairing a scratched or damaged clear coat on a vehicle?

A) Sanding and buffing
B) Applying touch-up paint
C) Using a paintless dent repair technique
D) Spray painting the affected area

Answer: C) Using a paintless dent repair technique

Q.4: When repairing a damaged body panel, which of the following is typically the first step?

A) Removing any trim or moldings
B) Sanding the damaged area
C) Applying primer to the repaired area
D) Welding the panel back together

Answer: A) Removing any trim or moldings

Q.5: What is the purpose of applying primer to a repaired body panel?

A) To protect the panel from corrosion
B) To provide a smooth base for paint adhesion
C) To strengthen the repaired area
D) To fill in any remaining dents or scratches

Answer: B) To provide a smooth base for paint adhesion

Q.6: Which of the following is a common method used to repair a small dent in a vehicle's body?

A) Heat the damaged area to reshape it
B) Apply a layer of body filler
C) Sandblast the affected area
D) Replace the entire body panel

Answer: B) Apply a layer of body filler

Q.7: What is the purpose of using Panel Adhesive during the body repair process?

A) To Adjoin two panels using adhesive
B) To remove any dust or debris from the panel
C) To seal off the panel from the outer environment
D) To protect the vehicle from harsh weather conditions

Answer: A) To provide a controlled environment for painting

Q.8: Which of the following is NOT a common step in the process of repainting a vehicle?

A) Applying a clear coat
B) Sanding the old paint off completely
C) Taping off areas that should not be painted
D) Applying a base coat of color

Answer: B) Sanding the old paint off completely

Q.9: What is the purpose of Sanding and buffing during the paint refinishing process?

A) To remove any imperfections and create a smooth surface
B) Apply a protective layer of wax on the paint
C) To speed up the drying process of the paint
D) To remove the clear coat and expose the base coat

Answer: A) To remove any imperfections and create a smooth surface

Q.10 Which of the following is a common method used to repair cuts in a vehicle's body?

A) Sandblasting
B) Welding
C) filler application
D) Clear coat application

Answer: B) Welding

2. **Section B** (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

Q.11 Explain Fiberglass along with its advantages.

Ans. Fiberglass is a composite material made up of glass fibers embedded in a polymer matrix, typically a type of resin. It is known for its strength, versatility, and lightweight nature. Here's an explanation of fiberglass along with its advantages:

Fiberglass is created by weaving or layering thin strands of glass fibers together to form a fabric-like material. This fabric is then saturated with a resin, such as polyester or epoxy, which hardens and binds the fibers together, resulting in a strong and durable composite.

Advantages of fiberglass include:

- Strength
- Lightweight
- Corrosion resistance
- Design flexibility
- Electrical insulation
- Thermal insulation
- Resistance to fire
- Cost-effective

Overall, the combination of strength, lightweight, corrosion resistance, design flexibility, and other advantageous properties make fiberglass a versatile material used in a wide range of applications, including construction, automotive, aerospace, marine, electrical, and many others.

Q.12 What do you understand by collision repair, explain it in four major stages.

Ans. Collision repair refers to the process of restoring a vehicle that has been damaged due to a collision or accident. It involves several stages to bring the vehicle back to its pre-accident condition. Here are the four major stages of collision repair:

Assessment and Estimation:

The first stage involves assessing the extent of the damage and providing an accurate estimate of the repair costs. A trained technician or estimator inspects the vehicle, identifies the visible and hidden damage, and prepares a detailed estimate of the necessary repairs. This includes assessing the structural integrity, mechanical components, body panels, and any necessary replacements.

Structural Repair:

If the vehicle's frame or structural components are damaged, structural repair becomes crucial. In this stage, the damaged parts are either repaired or replaced. Technicians use specialized equipment, such as frame straightening machines, hydraulic systems, and measuring tools, to realign the frame and restore its structural integrity. The goal is to ensure the vehicle meets the manufacturer's specifications and safety standards.

Body Repair and Refinishing:

Once the structural repairs are completed, the focus shifts to repairing the vehicle's body and preparing it for refinishing. This stage involves repairing or replacing damaged body panels, addressing dents, scratches, and other surface imperfections. The repaired areas are then sanded, primed, and prepped for painting. Matching the vehicle's original paint color is a critical step to achieve a seamless finish. The damaged panels are carefully painted, clear-coated, and polished to blend with the rest of the vehicle's surface.

Reassembly and Quality Control:
After the painting process, the vehicle goes through reassembly. This involves reinstalling repaired or replaced components, such as lights, mirrors, trim pieces, and interior parts. Mechanical repairs, if necessary, are performed at this stage. A thorough quality control inspection is carried out to ensure that all repairs have been completed correctly, and the vehicle meets safety and aesthetic standards. Test drives may also be conducted to ensure proper functionality and performance.

Q.13 Explain the back door replacement procedure.
Ans.
The back door replacement procedure, also known as rear door replacement, involves replacing a damaged or faulty back door on a vehicle. Here is an overview of the typical steps involved in the back door replacement process:

Assessment and Preparation:
The first step is to assess the damage to the back door and determine whether it can be repaired or needs complete replacement. If replacement is necessary, the technician will ensure they have the correct replacement door with the appropriate specifications for the vehicle make and model. The vehicle may be prepped by removing any interior trim panels or components that obstruct access to the door.

Door Panel Removal:
The interior trim panel on the back door is removed to gain access to the inner workings and fasteners. This typically involves removing screws, clips, and sometimes electrical connectors that hold the trim panel in place. Care is taken to avoid damaging any components during this process.

Disconnecting Electrical Components:
If the back door has electrical components such as power windows, locks, or speakers, the necessary electrical connections are disconnected. This may involve disconnecting wiring harnesses, control modules, or removing connectors. The technician ensures proper labeling or documentation to aid in reassembly.

Bolt and Hinge Removal:
The back door is usually secured to the vehicle's body through hinges and bolts. The bolts attaching the door to the hinges are removed, as well as any other fasteners that hold the door in place. This step requires caution and proper tools to avoid damaging surrounding areas or components.

Old Door Removal:
Once the bolts and fasteners are removed, the damaged back door is carefully detached from the vehicle's body. The technician may require an extra pair of hands or specialized equipment to ensure safe removal and prevent any further damage.

New Door Installation:
The replacement back door, prepped with any necessary components such as handles, trims, or glass, is aligned with the vehicle's body. The technician ensures proper alignment and fitment before securing the door with bolts and fasteners. The hinges are reattached, and all bolts and fasteners are tightened to the manufacturer's specifications.

Reconnecting Electrical Components:

If the back door had electrical components, the necessary wiring connections are reconnected. This includes reconnecting wiring harnesses, control modules, and any other electrical connectors that were disconnected during the removal process. Functionality checks may be performed to ensure proper operation of the electrical components.

Reassembly and Testing:
The interior trim panels and any other components that were removed are reinstalled. The technician ensures proper alignment and fitment of the trim panels and checks for any potential rattles or loose parts. Finally, a thorough test is conducted to ensure the back door opens, closes, and latches correctly, and all electrical components function properly.

Q.14 Explain Rust Removal Procedure.
The rust removal process involves eliminating rust from metal surfaces to restore their appearance, structural integrity, and prevent further corrosion. Here's an overview of the typical steps involved in rust removal:

Safety Precautions:
Before starting the rust removal process, it's essential to take appropriate safety precautions. This includes wearing protective gloves, goggles, and a mask to prevent any contact with rust particles or chemical agents used in the process. Additionally, working in a well-ventilated area or wearing a respirator is recommended when using chemical rust removers.

Surface Preparation:
The rusty surface needs to be prepared before the actual rust removal begins. This involves cleaning the surface to remove any loose dirt, grease, or flaking rust using a wire brush, sandpaper, or a suitable abrasive tool. Thorough cleaning ensures better access to the rusted areas and improves the effectiveness of the rust removal process.

Mechanical Methods:
Mechanical methods are often the first line of defense in rust removal. They involve physically removing the rust using tools like wire brushes, sandpaper, or abrasive discs. The rusted surface is vigorously scrubbed or sanded to eliminate as much rust as possible. Coarser abrasives may be used initially, followed by finer grits for a smoother finish.

Chemical Rust Removers:
Chemical rust removers can be used to dissolve and remove rust from metal surfaces. These solutions are typically applied to the rusted area and left to work for a specified period. The chemical reaction breaks down the rust, making it easier to remove. Different types of rust removers are available, such as phosphoric acid-based solutions or commercial rust converters. It's important to follow the manufacturer's instructions and safety guidelines when using chemical rust removers.

Rust Dissolving Soaks:
For smaller metal items or parts that can be soaked, rust dissolving solutions can be used. The rusty item is submerged in the rust remover solution for a specified time, allowing the solution to penetrate and dissolve the rust. After soaking, the item is typically scrubbed or rinsed to remove any remaining rust particles.

Neutralization and Cleaning:

After rust removal, it's crucial to neutralize any remaining rust converter or acid residues to prevent further corrosion. This is done by thoroughly rinsing the surface with water or a neutralizing solution recommended by the rust remover manufacturer. Once rinsed, the surface is dried completely.

Surface Protection:
To prevent future rust formation, it's important to apply a protective coating to the metal surface. This can be in the form of a primer, paint, or specialized rust-inhibiting products. The protective coating acts as a barrier, sealing the metal surface from moisture and preventing the onset of new rust.

3. Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

Q.15 Explain the door skin replacement procedure.
Ans. The door skin replacement procedure involves replacing the outer sheet metal panel (door skin) of a vehicle's door. This is typically done when the door skin is damaged, dented, or rusted beyond repair. Here's an overview of the typical steps involved in the door skin replacement process:

Assessment and Preparation:
The first step is to assess the extent of the damage and determine if the door skin needs to be replaced. If replacement is necessary, the technician will ensure they have the correct replacement door skin that matches the vehicle's make and model. The interior trim panel of the door may be removed to provide access to the inner workings and fasteners.

Door Panel Removal:
The interior trim panel is removed to gain access to the door's inner structure and fasteners. This involves removing screws, clips, and sometimes electrical connectors that hold the trim panel in place. Care is taken to avoid damaging any components during this process, and proper labeling or documentation is done to aid in reassembly.

Old Door Skin Removal:
The damaged door skin is carefully removed from the door's frame and structure. This may involve drilling out spot welds or using specialized tools to separate the door skin from the inner structure. It's important to exercise caution and avoid damaging the inner components or structure during the removal process.

Preparation of the Door Frame:
Once the old door skin is removed, the door frame and inner structure are inspected for any signs of damage or corrosion. If necessary, repairs or treatments may be performed to address any issues before the new door skin is installed. This may include sanding, cleaning, or applying rust inhibitors as required.

Fitting and Aligning the New Door Skin:
The replacement door skin is carefully aligned and positioned on the door's frame. The technician ensures a proper fit by adjusting the door skin and aligning it with the surrounding panels. This step is crucial to achieve an even gap and alignment with the vehicle's body.

Welding or Bonding:
Once the new door skin is properly positioned, it is either welded or bonded to the door's frame and inner structure. Welding involves spot welding the door skin to the frame, replicating the original factory spot welds.

Bonding may involve using specialized adhesives or structural adhesives that provide a strong and durable bond.

Trimming and Finishing:
After the door skin is securely attached, any excess material or edges are trimmed to achieve a clean and smooth finish. The technician ensures that the door operates smoothly and aligns properly with the vehicle's body. Any necessary adjustments are made to ensure proper functionality and fitment.

Reassembly and Testing:
The interior trim panel and any other components that were removed are reinstalled. The technician ensures proper alignment and fitment of the trim panel and checks for any potential rattles or loose parts. Finally, a thorough test is conducted to ensure the door opens, closes, and latches correctly.

Q.16 Explain the dent removal procedure.

Ans. The dent removal process involves repairing and restoring the shape of a vehicle's body panel that has been dented or damaged. There are various techniques and methods used to remove dents, depending on factors such as the size, location, and severity of the dent. Here's an overview of the typical steps involved in the dent removal process:

Assessment and Preparation:
The first step is to assess the dent and determine the best approach for repair. The technician examines the size, depth, and location of the dent to decide whether it can be repaired using paintless dent repair (PDR) techniques or if additional steps will be necessary. The damaged area is thoroughly cleaned and prepared for the repair process.

Heat and Cold Shrinking:
In some cases, using heat and cold shrinking methods can help remove dents. Heat is applied to the dented area using a heat gun or a specialized tool to expand the metal. Once the metal is heated, cold water or a cold cloth is applied to rapidly cool and contract the metal, helping to reduce the dent's size. This process is repeated until the dent is minimized or eliminated.

Body Filler and Sanding:
For dents that cannot be repaired through PDR or heat/cold shrinking, body filler may be used. The damaged area is cleaned and sanded to create a smooth surface for the application of body filler. The filler is then applied, shaped, and sanded down to match the contour of the panel. This process helps restore the surface and create a seamless finish.

Primer and Paint:
Once the body filler is sanded and the panel is smooth, a primer is applied to the repaired area. The primer helps create a suitable surface for paint adhesion and protects the metal from corrosion. After the primer is dry, the panel is painted to match the vehicle's original color using a color-matching system. Multiple layers of paint, including basecoat and clearcoat, are applied to achieve a smooth and durable finish.

Blending and Buffing:
To ensure a seamless blend between the repaired area and the surrounding paint, the technician may perform blending techniques. This involves feathering the new paint into the adjacent areas to create a smooth

transition. After the paint is dry, the panel is buffed and polished to restore its shine and match the gloss of the surrounding paint.

Quality Inspection:
Once the dent removal and painting process is complete, a thorough quality inspection is conducted. The repaired area is examined for any imperfections, such as uneven texture, color mismatch, or blemishes. If necessary, further adjustments or touch-ups are made to ensure the highest quality of the repair.

Q.17 Explain Dolly-on method along with an example.
Answer

- 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.

Q.18 List out the safety precautions we should take while working in a body shop.

Answer:

Working in a body shop involves various activities that may pose certain safety risks. It's crucial to prioritize safety to protect yourself and others in the work environment. Here is a list of safety precautions to consider while working in a body shop:

Personal Protective Equipment (PPE):
Always wear appropriate personal protective equipment, including safety glasses, gloves, protective clothing, and steel-toed boots. PPE helps protect against hazards such as chemicals, flying debris, sharp objects, and potential accidents.

Ventilation:
Ensure the work area is well-ventilated to minimize exposure to fumes, dust, and airborne particles. Proper ventilation helps maintain air quality and prevents the buildup of harmful substances.

Hazardous Material Handling:
Follow proper procedures for handling and disposing of hazardous materials, including paints, solvents, chemicals, and waste products. Store hazardous materials in designated areas, use appropriate containers, and follow local regulations and safety data sheets (SDS) for safe handling, storage, and disposal.

Equipment Safety:
Inspect and maintain tools, machinery, and equipment regularly to ensure they are in good working condition. Follow safe operating procedures, use equipment guards and safety features, and avoid using damaged or faulty equipment.

Fire Safety:

Have fire extinguishers readily available in the work area and ensure they are regularly inspected and maintained. Implement fire safety protocols, such as having clear emergency exits, fire alarms, and evacuation plans. Keep flammable materials properly stored and away from potential ignition sources.

Electrical Safety:
Adhere to electrical safety guidelines, including using grounded outlets, avoiding overloaded circuits, and properly maintaining electrical cords and equipment. Be cautious when working with electrical tools to prevent electrical shocks or fires.

Lifting and Handling:
Practice proper lifting techniques to avoid strains and injuries. Use mechanical aids, such as hoists or lift equipment, when lifting heavy objects. Avoid overexertion and seek assistance when needed.

Slip and Fall Prevention:
Keep work areas clean and free from clutter, spills, or debris that may cause slips or falls. Use non-slip mats, floor coatings, and proper lighting to improve safety. Clean up spills promptly and maintain good housekeeping practices.

Eye and Ear Protection:
Wear safety goggles or a face shield to protect your eyes from flying debris, dust, or chemicals. Use hearing protection, such as earplugs or earmuffs, in loud environments or when using noisy equipment.

Training and Communication:
Ensure all workers receive appropriate safety training, including hazard awareness, safe work practices, and emergency procedures. Encourage open communication about safety concerns and promote a safety culture within the body shop.

THEORY END-SEM EXAMINATION			
SESSION: 2022-23(WINTER SEMESTER)			
B.Voc	**Semester**	3rd	
Course Name / Module	Automotive Refinish Painting		
Course Code	AUT1304		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTION:

- Maximum Marks: 50
- Duration of Examination: 2 Hours
- Attempt all questions.

1. Section A (10 objective type questions, each question carries 01 mark)	**10×1 = 10**

1. Oswald Colour Theory is based on:

a) The arrangement of colours in a circular wheel
b) The three dimensions of hue, value, and Chroma
c) The concept of colour harmony
d) The RGB colour model

2. What is the purpose of sanding between coats of paint in automotive refinishing?

a) To remove dust and debris
b) To create a smooth surface
c) To promote paint adhesion
d) All of the above

3. What is the key difference between a 1-stage and 2-stage paint system?

a) Number of paint layers applied
b) Time required for drying
c) Colour options available
d) Application technique used

4. The Munsell Colour System defines colour using a notation system that includes:

a) RGB values
b) Hex codes
c) Hue, value, and Chroma value
d) Pantone numbers

5. What is the additional stage involved in a 3-stage paint system compared to a 2-stage system?

a) Primer stage
b) Base coat stage

c) Pearl coat stage
d) Clear coat stage

6. "Sagging" in paint occur due to:
a) Incorrect paint mixing ratio
b) Insufficient drying time
c) Gravity pulling the wet paint downward
d) Excessive air pressure during spraying

7. Which Gun is recommened for application of Clear coat?
a) 1.2
b) 1.3
c) 1.4
d) 1.8

8. Which of the following is an automotive refinishing paint defect?
a) Fish eye
b) Colour fading due to environmental exposure
c) Acid rain effects on paint
d) All of the above

9. Whic gun is recommended for application of primmer?
a) 1.2
b) 1.3
c) 1.4
d) 1.8

10. What is the Full form of DFT meter?
a) Dry Film Thickness meter
b) Dull Film Thicknesss meter
c) Dual Film Thickness meter
d) Non of the above

2. Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

11. What do you understand by tinting, toning and shading?
Ans: Tone: A pure pigment with just grey added. Tint: A pure pigment with just white added. Shade: a pure pigment with just black added.

12. Write steps for standard repair of a pannel for application of solid paint.
Ans:

- Inspection of pannel for defects
- Sanding the pannel to reach bare metal
- Degreasing the panel
- Mixing and application of putty over the dents in 3 coats
- After drying putty , Sanding it till we get smooth surface free from sanding scratches.
- Degreasing panel

- Mixing and application of Wash primer
- Mixing and application of Surfacer primer
- After surfacer is completly dryed, Sanding of surfacer primer till we get a smooth finish over the pannel.
- Degreasing the panel
- Mixing and application of Solid paint.

13. What do you understand by paint mixing? Write mixing ratio of mettalic paint

Ans:

Paint mixing refers to the process of combining different components or ingredients of paint to achieve the desired color, consistency, and properties. It involves thoroughly blending the paint base, pigments, solvents, additives, and other materials to create a uniform and consistent paint mixture.

Metallic mixing ration

(Base coat)

- 60-70% Binder
- 40-30% (Tinters)
- 30-55 gm Thinner

(Clear coat)

- 30-44gm Thinner
- 25gm Hardner
- 100gm Clearcoat

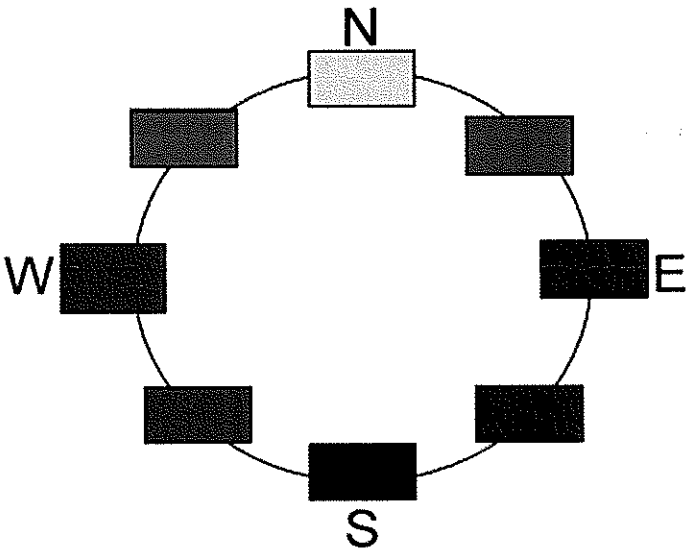
14. What is hue? Explain hue circle.

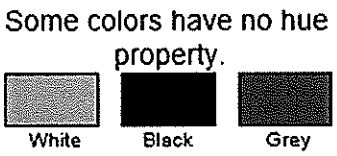
Ans: Hue is the most important property of color as it simply described by simply names of color.Colour names like red , blue , yellow etc. all are hue names.

The unique hues are shown at the cardinal locations.

That is like a compass: East = Red, North = Yellow, West = Green, South = Blue.

The combination colors are shown between their neighboring unique hues.





White, black and gray are "neutral" colors. They have no hue.

Neutral colors are not more related to one hue than to any other. To show this on the hue circle diagram, we place neutral colors at the center.

3. Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

15. Explain the following:

a) Water Spoting

b) Clouding

c) Solvent Popping

Ans:

a) Water Spoting:

Causes:

- Topcoat not sufficiently cured.
- Excessive film thickness, drying time too short.
- Use of unsuitable thinner.
- Incorrect hardener mixing ratio.
- Wrong hardener used.

Prevention:

- Follow application recommendations on technical data sheets

Remedies:

- After through-drying, remove marks by polishing
- Thoroughly dry topcoat, sand and repaint.

b) 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.

Prevention:

- Adjust material correctly.
- Keep spray gun parallel to object.
- Choose suitable spray gun set up.
- Use manufacturer's thinners.

Remedies:

- When using conventional base coat: use droplet method before spraying clear.
- After clear has through-dried, sand surface and repaint.

c) 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.

Prevention:

- Apply normal film thicknesses.
- Check oven temperature regularly.

Remedies:

- After drying, repaint without sanding.

- After drying and sanding, fill pinholes with Polyester Spray Filler or remove damaged finish and repaint.
- Sand, prime and repaint.

16. Write steps for pearlcent paint application?

Ans:

- Inspection of pannel for defects
- Sanding the pannel to reach bare metal
- Degreasing the panel
- Mixing and application of putty over the dents in 3 coats
- After drying putty , Sanding it till we get smooth surface free from sanding scratches.
- Degreasing panel
- Mixing and application of Wash primer
- Mixing and application of Surfacer primer
- After surfacer is completly dryed, Sanding of surfacer primer till we get a smooth finish over the pannel.
- Degreasing the panel
- Mixing and application of Solid paint (base coat) (Wait till it's dryed)
- Mixing and application of pearl coat(Wait till it's dryed)
- Mixing and application of Clear coat(Top Coat) (Wait till it's dryed)

17. Describe the importance of proper sanding techniques in automotive paint preparation.

Ans:

Proper sanding techniques in automotive paint preparation are crucial for achieving a smooth and flawless finish. When done correctly, sanding helps to remove imperfections, such as orange peel, runs, and dust nibs, from the paint surface. It also promotes adhesion between layers of paint, enhances the paint's overall appearance, and allows for better blending of colours during touch-up or repair work.

One important aspect of proper sanding is selecting the appropriate grit sandpaper. Coarser grits, such as 120 or 180, are typically used for initial sanding to remove imperfections, while finer grits, such as 320 or 400 and above, are used for final sanding to create a smooth surface. It is essential to progress gradually from coarser to finer grits to avoid excessive material removal and damage to the underlying layers.

Furthermore, sanding should be done using consistent pressure and motion, such as using a sanding block or sanding pad to maintain an even surface. Care should be taken to avoid sanding through the clear coat or base coat, which can lead to colour variations or primer exposure. Sanding should also be followed by thorough cleaning and removal of dust and debris before applying additional layers of paint.

Overall, proper sanding techniques play a vital role in achieving a professional-looking automotive paint job by ensuring a smooth and blemish-free surface that allows subsequent layers of paint to adhere properly and produce a visually appealing and durable finish.

Regenerate response

18. Discuss the role and importance of primer and tinter in the automotive paint process.

Ans:

Primer and tinter play important roles in the automotive paint process, contributing to the overall quality and durability of the paint job.

Primer: Primer serves as the foundation for the paint system, providing several key functions:

1. Surface Preparation: Primer prepares the surface by filling in any imperfections, such as scratches, dents, or minor bodywork repairs. It creates a smooth and even surface for the paint layers to adhere to.

2. Adhesion Promotion: Primer enhances the adhesion of the paint layers to the substrate, promoting long-lasting durability. It creates a bond between the surface and the paint, preventing peeling, cracking, or flaking.
3. Corrosion Protection: Primer acts as a barrier against corrosion, especially on metal surfaces. It helps prevent rust and extends the lifespan of the painted surface.

Tinter: Tinter refers to the colour pigments added to the paint to achieve specific shades or colour variations. Here are some key points regarding tinters:

1. Colour Customization: Tinter allows for color customization, enabling paint technicians to match the desired colour accurately. It provides flexibility in achieving colour consistency and accuracy across different parts of the vehicle.
2. Colour Matching: Tinter plays a crucial role in matching the existing colour of a vehicle during repair or touch-up work. It ensures that the repaired area blends seamlessly with the surrounding panels, creating a uniform appearance.
3. Adjusting Colour Depth and Intensity: Tinter allows paint technicians to adjust the colour's depth and intensity by adding more or less tinter to the base paint. This flexibility helps achieve the desired colour tone and hue.

Both primer and tinter contribute to the overall quality, appearance, and longevity of an automotive paint job. Primer prepares the surface, enhances adhesion, and provides corrosion protection, while tinter allows for colour customization, matching, and adjusting colour depth. Their correct application and proper use are vital in achieving a professional and durable automotive paint finish.

THEORY END-SEM EXAMINATION			
SESSION: 2022-23(WINTER SEMESTER)			
B.Voc	**Semester**	3rd	
Course Name / Module	Automotive Refinish Painting		
Course Code	AUT1304		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTION:
• Maximum Marks: 50 • Duration of Examination: 2 Hours • Attempt all questions.

1. Section A (10 objective type questions, each question carries 01 mark)	**10×1 = 10**

1. Oswald Colour Theory is based on:

a) The arrangement of colours in a circular wheel

b) The three dimensions of hue, value, and Chroma

c) The concept of colour harmony

d) The RGB colour model

2. What is the purpose of sanding between coats of paint in automotive refinishing?

a) To remove dust and debris

b) To create a smooth surface

c) To promote paint adhesion

d) All of the above

3. What is the key difference between a 1-stage and 2-stage paint system?

a) Number of paint layers applied

b) Time required for drying

c) Colour options available

d) Application technique used

4. The Munsell Colour System defines colour using a notation system that includes:

a) RGB values

b) Hex codes

c) Hue, value, and Chroma value

d) Pantone numbers

5. What is the additional stage involved in a 3-stage paint system compared to a 2-stage system?

a) Primer stage

b) Base coat stage

c) Pearl coat stage
d) Clear coat stage

6. "Sagging" in paint occur due to:
a) Incorrect paint mixing ratio
b) Insufficient drying time
c) Gravity pulling the wet paint downward
d) Excessive air pressure during spraying

7. Which Gun is recommened for application of Clear coat?
a) 1.2
b) 1.3
c) 1.4
d) 1.8

8. Which of the following is an automotive refinishing paint defect?
a) Fish eye
b) Colour fading due to environmental exposure
c) Acid rain effects on paint
d) All of the above

9. Whic gun is recommended for application of primmer?
a) 1.2
b) 1.3
c) 1.4
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10. What is the Full form of DFT meter?
a) Dry Film Thickness meter
b) Dull Film Thicknesss meter
c) Dual Film Thickness meter
d) Non of the above

2. Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

11. What do you understand by tinting, toning and shading
12. Write steps for standard repair of a pannel for application of solid paint.
13. What do you understand by paint mixing? Write mixing ratio of mettalic paint
14. What is hue? Explain hue circle.

3. Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

15. Explain the following:
a) Water Spoting
b) Clouding
c) Solvent Popping

16. Write steps for pearlcent paint application?
17. Describe the importance of proper sanding techniques in automotive paint preparation.
18. Discuss the role and importance of primer and tinter in the automotive paint process.

THEORY END-SEM EXAMINATION			
SESSION: 2022-23(WINTER SEMESTER)			
B.Voc	**Semester**	3rd	
Course Name / Module	Automotive Refinish Painting		
Course Code	AUT1304		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTION:

- Maximum Marks: 50
- Duration of Examination: 2 Hours
- Attempt all questions.

1. Section A (10 objective type questions, each question carries 01 mark)	**10×1 = 10**

1. What is the purpose of the base coat in automotive refinish painting?

a) To provide gloss and shine
b) To protect the underlying layers
c) To provide colour and coverage
d) To increase adhesion

2. Which type of paint is commonly used for the base coat in automotive refinish painting?

a) Primer
b) Clear coat
c) Metallic paint
d) Solvent-based paint

3. What is the purpose of the clear coat in automotive refinish painting?

a) To provide colour and coverage
b) To protect the base coat
c) To increase adhesion
d) To remove imperfections

4. What is the recommended method for applying automotive refinish paint?

a) Brushing
b) Rolling
c) Spraying
d) Dipping

5. What is the purpose of the primer surfacer in automotive refinish painting?
a) To provide colour and coverage
b) To protect the base coat
c) To increase adhesion
d) To remove imperfections

6. Tinting refers to:
a) Adding white in a hue
b) Adding black in a hue
c) Adding grey in a hue
d) All of the above

7. Which factor can affect the drying time of automotive refinish paint?
a) Temperature and humidity
b) Number of base coats applied
c) Type of primer used
d) Brand of paint used

8. Which of the following is a safety precaution when working with automotive refinish paint?
a) Working in a poorly ventilated area
b) Not wearing protective eyewear
c) Not wearing gloves
d) Using a respirator

9. What should be done after paint sanding to ensure a smooth finish?
a) Apply a clear coat
b) Degrease the surface
c) Rinse the surface with water
d) Apply a wax or polish

10. Which of the following is not a primary color used in automotive paint tinting?
a) Red
b) Blue
c) Yellow
d) Black

2. Section B (04 short answer type questions, each question carries 04 marks) **04×04 = 16**

11. Explain chroma and chroma property of hue circle.
12. Explain AM1,AM2 white tinting.
13. What do you understand by runs and orange peel paint defect?
14. Explain Process of Paint gun setup?

3. Section C (04 long type questions, each question carries 06 marks) **04×06 = 24**

15. Explain Process of Plastic bumper painting?
16. Explain Oswald and Munsell Colour theory?

17. Explain any 3 paint defects caused due to environmental effects.
18. What do you understand by flop controller? Why is it important to properly prepare a vehicle's surface before painting? What safety precautions should be taken while working in a automotive paint workshop?

THEORY END-SEM EXAMINATION			
SESSION: 2022-23(WINTER SEMESTER)			
B.Voc	**Semester**	3rd	
Course Name / Module	Automotive Refinish Painting		
Course Code	AUT1304		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTION:
• Maximum Marks: 50 • Duration of Examination: 2 Hours • Attempt all questions.

1. Section A (10 objective type questions, each question carries 01 mark)	**10×1 = 10**

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a) To provide gloss and shine
b) To protect the underlying layers
c) To provide colour and coverage
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2. Which type of paint is commonly used for the base coat in automotive refinish painting?
a) Primer
b) Clear coat
c) Metallic paint
d) Solvent-based paint

3. What is the purpose of the clear coat in automotive refinish painting?
a) To provide colour and coverage
b) To protect the base coat
c) To increase adhesion
d) To remove imperfections

4. What is the recommended method for applying automotive refinish paint?
a) Brushing
b) Rolling
c) Spraying
d) Dipping

5. What is the purpose of the primer surfacer in automotive refinish painting?
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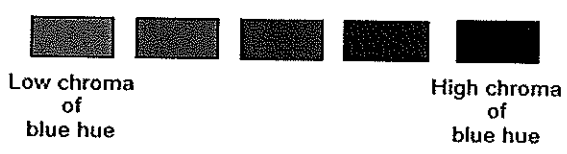
a) Apply a clear coat
b) Degrease the surface
c) Rinse the surface with water
d) Apply a wax or polish

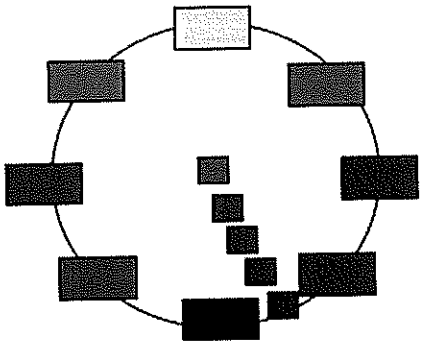
10. Which of the following is not a primary color used in automotive paint tinting?
a) Red
b) Blue
c) Yellow
d) Black

Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

11. Explain chroma and chroma property of hue circle.
Ans:
Chroma: The attribute with which we can classify color on the basis of their Brightness and dullness is called Chroma.



Chroma property of hue circle: Neutral colors have no hue and no Chroma. The neutral color is placed at the center of the hue circle. A maximum Chroma color of a particular hue is placed at the outer edge of the hue circle. A Chroma sequence varying from low to high Chroma is placed on a radius of the hue circle.



12. Explain AM1,AM2 white tinting.

Ans: AM1 - WHITE - HIGH STRENGTH

AM2 - WHITE - LOW STRENGTH

- Darker in head-on angle
- Lighter in side-on angle
- Darker in near-specular angle
- Change AM1 to AM2 when the concentration of AM1 is less than 0.45% of the total formula weight. When concentration of AM2 is higher than 8%, use AM1
- Change AM1 to AM2: concentration of AM1 x 10

13. What do you understand by runs and orange peel paint defect?

Ans:

- Runs: Runs refer to excessive paint build up that drips or sags down the painted surface, creating visible streaks or "runs." Runs occur when too much paint is applied in a single coat or when the paint is applied too thickly. This can happen due to improper spray technique, using incorrect paint viscosity, or applying too much paint in one area without allowing proper drying time between coats. Runs can negatively affect the appearance of the paintwork, leading to uneven surfaces and an unprofessional finish.
- Orange Peel: Orange peel is a paint defect characterized by a textured surface that resembles the skin of an orange. It occurs when the painted surface appears rough, with a dimpled or bumpy texture. Orange peel is often caused by improper spray technique or incorrect paint viscosity. Factors such as spraying at an incorrect distance, using the wrong air pressure, or applying paint in adverse environmental conditions (such as high humidity or extreme temperatures) can contribute to orange peel. This defect can affect the overall aesthetics of the paint job, giving it an uneven and less glossy appearance.

14. Explain Process of Paint gun setup?

Ans:

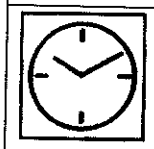
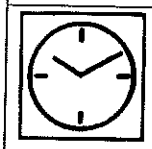
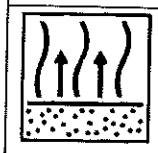
1. Gun Assembly: Assemble the paint gun according to the manufacturer's instructions. Attach the appropriate air hose to the gun, ensuring a secure connection.

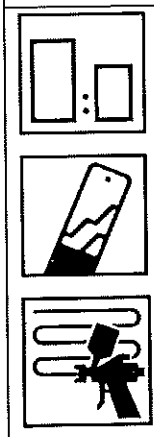
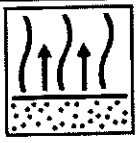
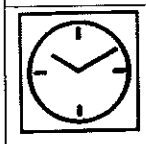
2. Air Pressure Adjustment: Connect the air compressor to the air hose and adjust the air pressure regulator to the recommended range specified by the paint manufacturer. This range can typically be found on the paint can or technical data sheet. Use a separate air pressure gauge if your spray gun does not have an integrated regulator.
3. Fluid Control and Nozzle Selection: Adjust the fluid control knob or needle adjustment on the paint gun. Start by fully closing the fluid control and then gradually open it while pulling the trigger, creating a fan-shaped spray pattern. Adjust the fluid control to achieve the desired paint flow for the job. Select the appropriate nozzle size for the type of paint and the desired finish.
4. Spray Pattern Adjustment: Adjust the spray pattern by rotating the air cap or nozzle on the paint gun. For most automotive applications, a horizontal or vertical fan pattern is used. Adjust the pattern width and shape to cover the desired area evenly.
5. Test Spray: Before applying the paint to the surface, perform a test spray on a scrap material or test panel. This allows you to ensure that the paint gun is properly set up, and the paint flow, atomization, and pattern are adjusted correctly. Adjust the fluid control, air pressure, or spray pattern as needed.

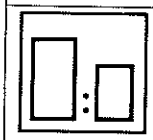
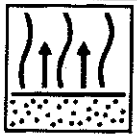
Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

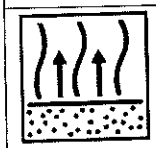
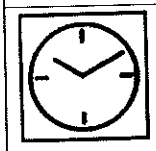
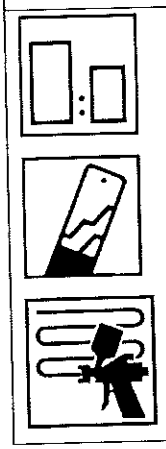
15. Explain Process of Plastic bumper painting?

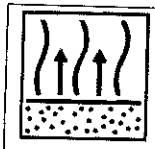
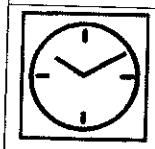
Ans:

		Substrate pre-treatment / Primer application	All plastic parts commonly found on vehicle exteriors (PP, EPDM, ABS, PC, PPO, PBTP, UP-GF, PA, PVC, R-TPU, PUR, PUR flexible)
	**5.1.1**	Heat plastic parts for 60 minutes at +60°C object temperature	• Oven
	**5.1.2**	Carefully clean with antistatic cleaner	
	**5.1.3**	Heat plastic parts for 30 - 40 minutes at +60°C object temperature	• Oven
	**5.1.4**	Lightly clean parts once more with antistatic cleaner	
	**5.1.5**	Apply 1.5 coats of plastic primer / sealer	• Spray gun of 1.3-1.4mm nozzle size.
	**5.1.6**	Flash off time 5-10 minutes.	

		**Putty** **(for minor damages)**	If required
	**5.2.1**	Mix putty according to TDS and apply	Putty application tools
	**5.2.2**	Drying: • Air dry- 20-30 minutes at 20°C • **IR – 3 minutes short wave IR at 50% power and 80cm distance**	Short wave Infra-red dryer
	5.2.3	Sanding: • first sanding • second sanding	• hand block (sanding file) andP180 grade sandpaper • dual action orbital sander and P 320grade sandpaper
		Primer Surfacer	
	**5.3.1**	Blow parts with compressed air, lightly clean once more and wipe with a tack cloth	Air blower gun, lint- free paper/cloth
	**5.3.2**	• mix the primer Surfacer • apply 1 tack coat followed by a normal full coat	Mixing pot, mix stick, strainer, spray gun 1.6-1.8mm nozzle
	**5.3.3**	• Intermediate flash-off as per TDS Flash-off before force drying as per TDS	Spray gun to aid flash-off
	**5.3.4**	Drying: • Air dry refer to product TDS • Oven bake refer to product TDS	• oven

		• **IR – 10 minutes short wave IR at 50% power and 80cm distance**	• infrared dryer
	5.3.5	Guide coat: apply a dust coat	
	**5.3.6**	Sanding: • Dry – P320 –P400 dry grit on a dual action orbital sander • Sand edges by hand Or • Wet sanding P600-P800	• Dual action orbital sander, P320 – P400 dry grit paper • Soft pad, P400 dry grit paper • Hand block, P600-P800 wet grit paper
		Top coat	two-stage / three-stage high-gloss/semi glossy/matt finish
	**5.4.1**	Clean with degreaser and wipe with a tack cloth; blow part with compressed air (not with wet-on-wet application)	Air blower gun, lint-free paper/cloth, tack cloth
  	**5.4.2**	• mix the base coat • apply a) 2.5 coats for metallic/two stage pearl colours = 15 - 20µm b) 2.5 coats of under coat followed by 1.5-2 coats of base-coat for three-stage pearl colours = 40 - 45µm	Mix pot, mixing stick, spray gun with 1.3-1.4mm nozzle
	**5.4.3**	• intermediate flash-off time: 5 - 10 minutes • flash-off time before clear coat: 15 - 20 min.	

	**5.4.4**	• mix clear coat • apply 1.5 coats of glossy / semi glossy / matt clear coat as per the need.	Mix pot, mixing stick, spray gun with 1.3-1.4mm nozzle
	**5.4.5**	Flash-off according to TDS	
	**5.4.6**	Drying • Air Dry: according to TDS • Oven Bake: according to TDS • IR Drying: according to TDS	• oven • Short wave IR
		Top coat	**Single stage high-glossy/semi glossy/ matt finish**
	**5.5.1**	• Mix and apply 2.5 coats of high glossy/semi glossy/matt solid colour	Mix pot, mixing stick, spray gun with 1.3-1.4mm nozzle

	**5.5.2**	• Intermediate flash-off 5 minutes Flash-off before force drying 5-10 minutes	
	**5.5.3**	Drying • Air Dry: according to TDS • Oven Bake: according to TDS • IR Drying: according to TDS	• oven • Short wave IR

16. Explain Oswald and Munsell Colour theory?

Ans:

The Oswald color theory, proposed by German physicist and psychologist Johannes Itten Oswald, is based on the idea that colors can be categorized into seven distinct groups based on their perceptual qualities: white, black, red, yellow, green, blue, and purple. These colors are arranged in a color wheel, with complementary colors opposite each other on the wheel.

The Munsell color system, on the other hand, is a more comprehensive system for describing colors, developed by American artist and scientist Albert Munsell. This system is based on the three dimensions of color: hue, value, and chroma.

In the Munsell system, colors are identified using a notation that specifies their hue, value, and chroma. For example, a color might be described as "5YR 6/4," which means it has a hue of 5YR (yellow-red), a value of 6 (medium lightness), and a chroma of 4 (moderate intensity).

17. Explain any 3 paint defects caused due to environmental effects.

Ans:

- Colour Fade:

Causes:

- Sunlight UV light effect on certain paint pigments in surface.
- Refinish paints of low quality with little or no UV blocker.

Prevention:

- Frequent wax polishing to provide protection.

Remedies:

- Can be removed in part by machine polishing with fine abrasive paste.
- Avoid over polishing, can be checked with film thickness gauge.
- Refinish if necessary.

- Corrosion:

Causes:

- Moisture penetration through broken areas in paint film.

- Exposed bare metal areas.
- Climate and time influence may lead to corrosion.

Prevention:

- Frequent washing and wax polishing of the vehicle, particularly in winter.
- Refinish broken paint surfaces immediately to prevent corrosion starting.

Remedies:

- Remove affected paint areas.
- Treat with neutralising acid.
- Refinish with approved system.

- **Water Spotting**

Causes:

- Vehicles washed with water from" hard" water supply.
- Visible on dark colours, particularly on vehicles washed in direct sunlight.

Prevention:

- Never wash vehicles with household detergent.
- Rinse vehicle with chemically softened water.
- Dry vehicle directly after washing.

Remedies:

- Wash vehicle with wax containing shampoo.
- Dry with damp leather cloth.

Severe stains may need polishing to remove

18. What do you understand by flop controller? Why is it important to properly prepare a vehicle's surface before painting? What safety precautions should be taken while working in a automotive paint workshop?

Ans:

Flop controller: A flop control agent added to basecoat absorbs light, limits flop and controls flake orientation.

Proper surface preparation is crucial for achieving a high-quality paint job. It involves cleaning, sanding, and priming the surface to remove dirt, rust, and imperfections. This ensures good paint adhesion, smoothness, and longevity of the paint finish.

When working with automotive paints, it is important to wear appropriate personal protective equipment (PPE), including a respirator, goggles, gloves, and a paint suit. Proper ventilation is crucial to ensure the dispersion of fumes. Additionally, flammable materials should be stored safely, and fire safety protocols should be followed.

THEORY END-SEM EXAMINATION			
SESSION: 2022-23 (WINTER SEMESTER)			
B.Voc	**Semester**	3rd	
Course name / Module	Automotive Electrical & AC.		
Course code	AUT1305		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTIONS

- Maximum Marks: **50**
- Duration of Examination: **02 Hour**
- Attempt all questions.

1. Section A (10 objective type questions, each question carries 01 mark)	**10×1 = 10**

1. The capacity of a 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 faster 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 induced electric current through the variation of magnetic field is called.....
   (a) Electrification
   (b) Patience
   (c) Electromagnetic induction
   (d) Parabolic
4. A transformer helps in transforming:
   (a) Current
   (b) Voltage
   (c) Both A and B
   (d) frequency
5. The materials property by which the application of force/pressure generates electricity is called:

a) Static electricity

b) Piezoelectricity

c) Conductivity

d) None of the above

6. Ohm's law is applicable to:

a) Semiconductors

b) Vacuum tubes

c) Carbon resistors

d) None of these

7. Correct form of ohm's law:

a) $I = VR$

b) $V \propto I$

c) $V = IR$

d) Above B and C

8. Electrical current can only flow in_____electric circuit.

(a) closed

(b) Open

(c) Both A and B

(d) None of these

9. Direction of magnetic field lines inside the magnet:

(a) North pole to South pole

(b) South pole to north pole

(c) Both A and B

(d) None of these

10. 1 microvolt is equal to:

a) 1×10^{-3} V

b) 1×10^{-4} V

c) 1×10^{-5} V

d) 1×10^{-6} V

2. Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

1. Define transformer? Explain the function of a transformer and its types.
2. Explain piezoelectricity effect and its use in a vehicle.
3. The charging and discharging of vehicle battery done through which external and internal electrical components? Name them.
4. Explain Ohms law and with help of diagrams explain how ohms' law behaving with change in voltage, current and resistance?

3. Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

1. Explain principal of operation, construction and chemical reaction of 12 Volt battery used in vehicle.
2. Explain Automotive AC system its working with neat sketch.
3. Explain relay, why it is used in electrical circuit. Draw circuit diagram of normally open relay and normally close relay along with its code.
4. Solve the mixed-circuit wiring diagram, and find out the following quantities as given below:
   a. Total Resistance.

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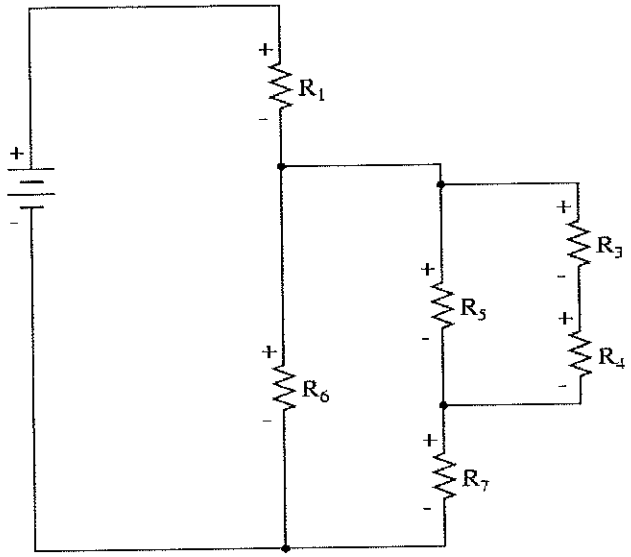
b. Total Current.

(Given: R1 = 200 ohms, R3 = 230 ohms, R4 = 100 ohms, R5 = 200 ohms, R6 = 60 ohms & R7 = 250 ohms, Voltage of the battery is 24 Volts).



THEORY END-SEM EXAMINATION			
SESSION: 2022-23 (WINTER SEMESTER)			
B.Voc/M.Voc	**B. Voc**	**Semester**	3rd-----
Course name / Module	Automotive Electrical & AC		
Course code	AUT1305		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTIONS

- Maximum Marks: **50**
- Duration of Examination: **02 Hour**
- Attempt all questions.
- Any other instruction may be included, if required. No

1. Section A (10 objective type questions, each question carries 01 mark) **10×1 = 10**

1. a
2. b
3. d
4. e
5. a
6. b
7. c
8. d
9. a
10. b

2. Section B (04 short answer type questions, each question carries 04 marks) **04×04 = 16**

1. Define transformer? Explain the function of a transformer.
   A transformer is a device that transfers electric energy from one alternating-current circuit to one or more other circuits, either increasing (stepping up) or reducing (stepping down) the voltage.
2. Explain piezoelectricity.
   Piezoelectricity is the electric charge that accumulates in certain solid materials—such as crystals, certain
3. The charging and discharging of vehicle battery done through which external and internal electrical components? Name them.
   Startor and Alternator
4. It states that voltage is directly proportional to current, V=IR is equal to ohms' law. Voltage increase current increase and vice versa.

3. Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

1. Explain principal of operation, construction and chemical reaction of 12 Volt battery.

Chemical Reaction for Discharging

When the battery is discharged, it acts as a galvanic cell and the following chemical reaction occurs.
Negative:
$Pb(s) + HSO_4^- + H_2O(l) \rightarrow 2e^- + PbSO_4(s) + H_3O^+(aq)$ (oxidation)
Positive:
$PbO_2(s) + HSO_4^-(aq) + 3H_3O^+(aq) + 2e^- \rightarrow PbSO_4(s) + 5H_2O(l)$ (reduction).

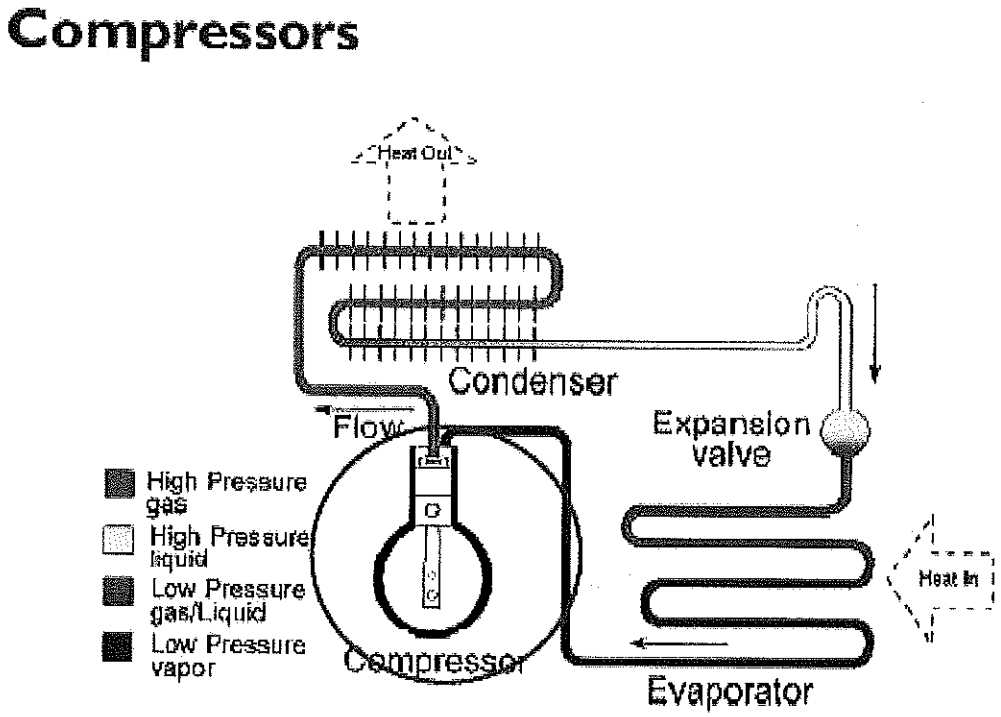
2. Automotive AC system and its components are:

   Compressor

   Condenser,

   Expansion valve

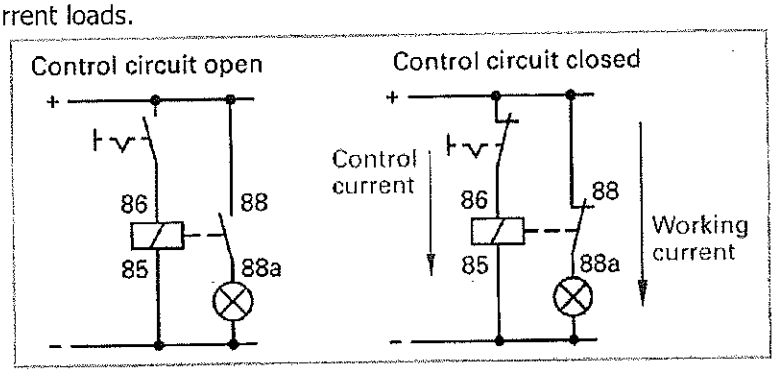
   Evaporator



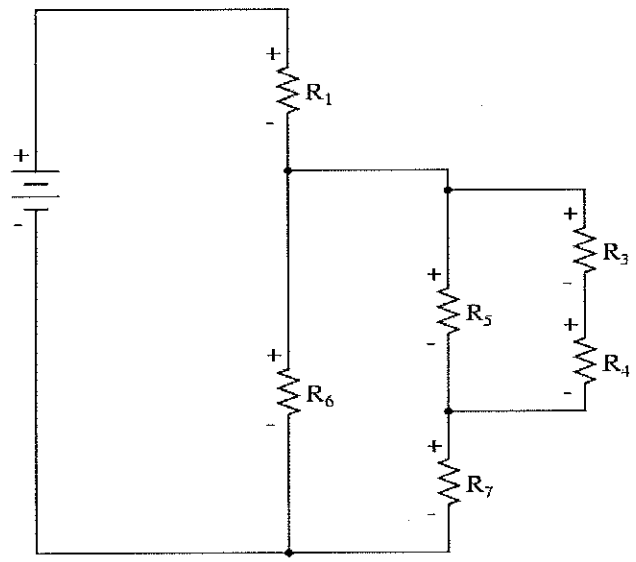
3. Explain relay, why it is used in electrical circuit. Draw circuit diagram of normally open relay and normally close relay along with its code.

A relay is an electrically operated switch. The relay permits a small amount of electrical current to

control high current loads.



4. Resultant is:



R (Total) = 126.48 ohms or 127 ohms.

I (Total) = 0.1897 A or 190 mA.

THEORY END-SEM EXAMINATION			
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B.Voc	**Semester**	3rd	
Course name / Module	Automotive Electrical & AC.		
Course code	AUT1305		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTIONS
• Maximum Marks: **50**
• Duration of Examination: **02 Hour**
• Attempt all questions.

1. Section A (10 objective type questions, each question carries 01 mark)	**10×1 = 10**

Q. 1 An ammeter is an electrical instrument used to measure:

a. Current

b. Voltage

c. Resistance

d. None of the above

Q.2 The electrical charge is the unit of:

a. Volt

b. Ampere

c. Joule

d. Coulomb

Q.3 Flows of current in a circuit when:

a. A switch is opened

b. A switch is closed

c. The switch is either open or closed

d. There is no voltage

Q.4 With Ohm's law, if voltage increases and resistance stays the same:

a. Current remains the same

b. Power decreases

c. Current increases

d. Resistance decreases

Q.5 A transformer is used to transform:

a. Current

b. Voltage

c. Frequency

d. Both A and B

Q.6 The process of producing electric current through the variable magnetic field is called:

a. Electrification
b. patience
c. Electromagnetic induction
d. Parabolic

Q.7 The battery capacity is expressed in terms of:

a. Current rating
b. Voltage rating
c. Ampere hour rating
d. None of the above

Q.8 The direction of the arrow represents the direction of ..... When the diode is forward biased?

a. P-type material
b. N-type material
c. P-N Junction
d. Conventional current flow

Q.9 Out of which is the most commonly use refrigerant in AC?

a. R134a
b. Water
c. Alcohol
d. Ethylene glycol

Q.10. The function of a compressor is:

a. To compress the water
b. To compress the refrigerant
c. To compress the air
d. None of the above

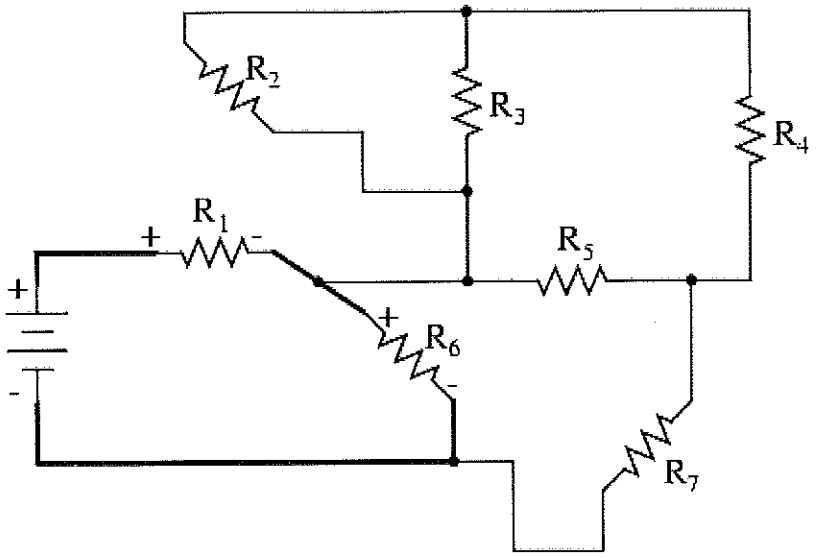
2. Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

1. Define transistor and its function. How transistor is used in a circuit with diagram.
2. Explain faraday law of electromagnetic induction.
3. Write down the standard operating procedure for setting up Multi-meter for measurement of electrical properties also write down the name of properties you can measure through multi-meter.
4. Write down various electrical symbols used in automotive electrical system along with their names.

3. Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

1. Explain principal of operation, construction and chemical reaction of auxiliary battery system used in vehicle.
2. Draw lighting system wiring diagram of an automotive vehicle.
3. Explain VCRS system and its components working with neat sketch.
4. Solve the mixed-circuit wiring diagram, and find out the following quantities as given below:
   a. Total Resistance.
   b. Total Current.

(Given: R1 = 200 ohms, R2 = 100 ohms, R3 = 115 ohms, R4 = 100 ohms, R5 = 200 ohms, R6 = 10 ohms & R7 = 250 ohms, Voltage of the battery is 48 Volts).



THEORY END-SEM EXAMINATION			
SESSION: 2022-23 (WINTER SEMESTER)			
B.Voc/M.Voc	**B. Voc** **Semester**	3rd-----	
Course name / Module	Automotive Electrical & AC		
Course code	AUT1305		
Date			
Name of the Student		**Reg. No.**	

INSTRUCTIONS

- Maximum Marks: **50**
- Duration of Examination: **02 Hour**
- Attempt all questions.
- Any other instruction may be included, If required.

1. Section A (10 objective type questions, each question carries 01 mark)	**10×1 = 10**

1. a
2. b
3. d
4. e
5. a
6. b
7. c
8. d
9. a
10. b

2. Section B (04 short answer type questions, each question carries 04 marks)	**04×04 = 16**

1. Transistor is a type of semiconductor device that can be used to conduct and insulate electric current or voltage. Transistor act as an amplifier and switch.
2. Faraday's first law of electromagnetic induction states, "Whenever a conductor is placed in a varying magnetic field, an electromotive force is induced. Likewise, if the conductor circuit is closed, a current is induced, which is called induced current
3. Current voltage etc.

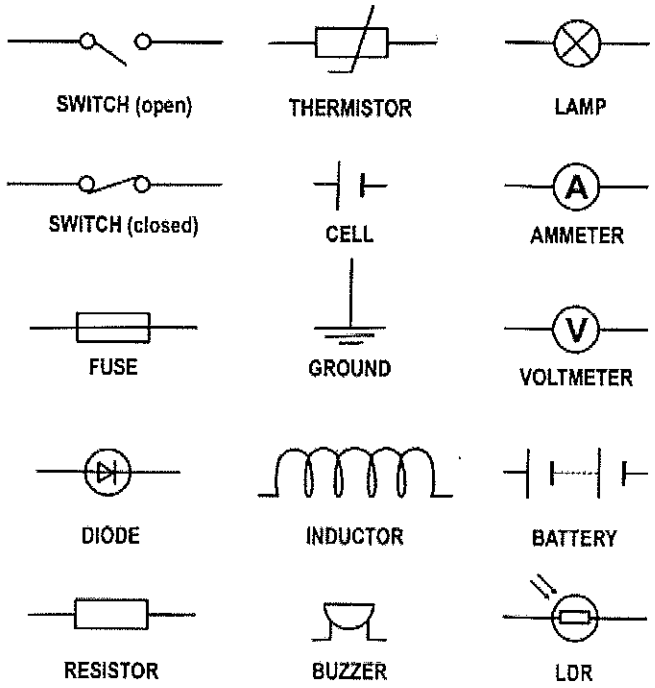
Follow these steps to measure voltage:

a. Wearing the appropriate PPE: safety glasses, voltage rated rubber gloves with leather protectors and nonflammable clothing, etc.
b. Select the appropriate voltage setting, A/C or D/C.
c. Plug the test probes into the appropriate probe jacks, Common and V.
d. Connect the tips of the probes across the source or load.

e. View the reading on the display unit. Be sure to note the unit of measurement. If you are testing DC voltage and a negative sign appears in the display, the polarity of your probes is incorrect and needs to be reversed.

f. Turn the meter off when testing is complete. This will prolong battery life.

4. Electrical symbols diode, switch resistance, capacitor etc.



3. Section C (04 long type questions, each question carries 06 marks)	**04×06 = 24**

1. Explain principal of operation, construction and chemical reaction of lead acid battery.

Chemical Reaction for Discharging

When the battery is discharged, it acts as a galvanic cell and the following chemical reaction occurs.
Negative:
$Pb(s) + HSO_4^- + H_2O(l) \rightarrow 2e^- + PbSO_4(s) + H_3O^+(aq)$ (oxidation)
Positive:
$PbO_2(s) + HSO_4^-(aq) + 3H_3O^+(aq) + 2e^- \rightarrow PbSO_4(s) + 5H_2O(l)$ (reduction).

2. Wiring diagram: Lighting system wiring diagram includes, reverse light, interior light, instrument cluster light, license plate light and left, right light passing through various fuses F15, F16, F17, F18, and F19 etc.

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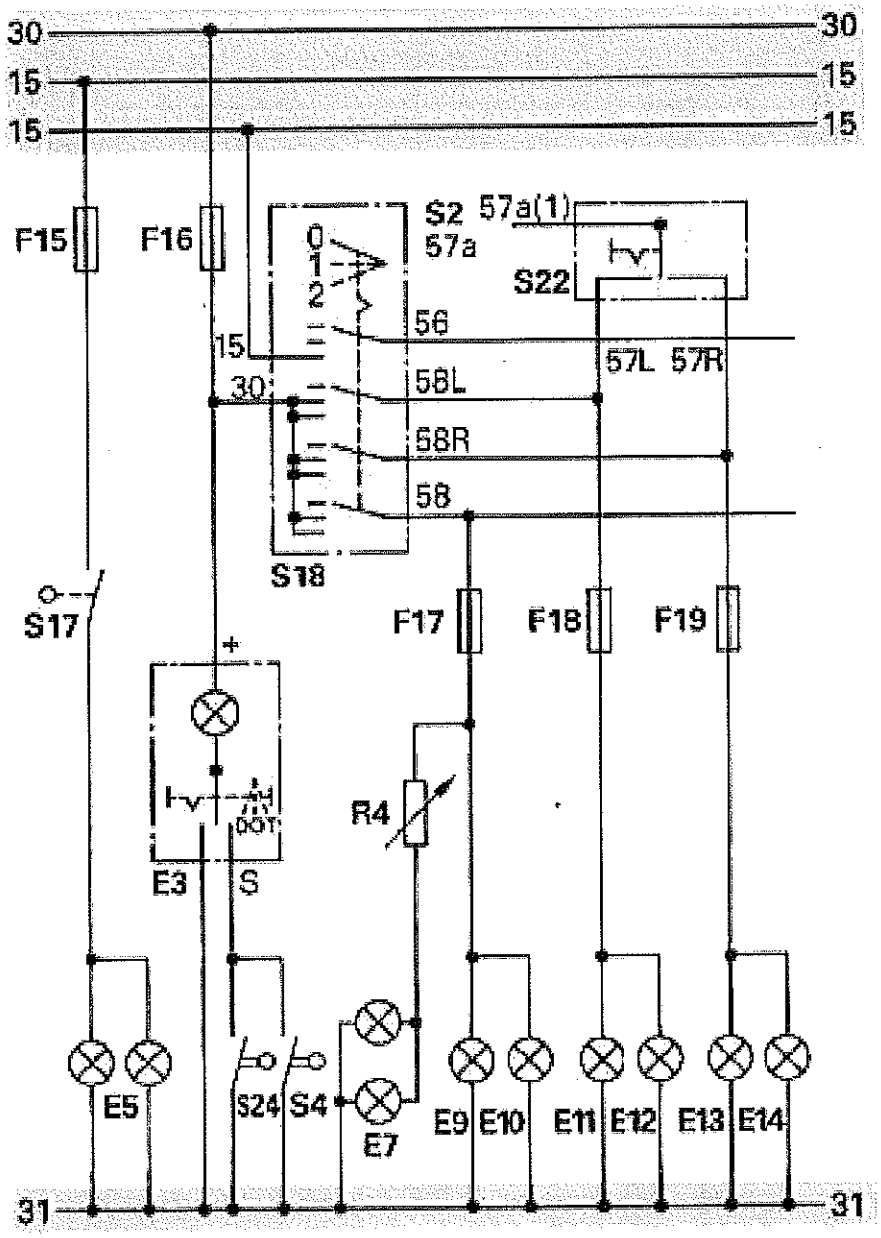


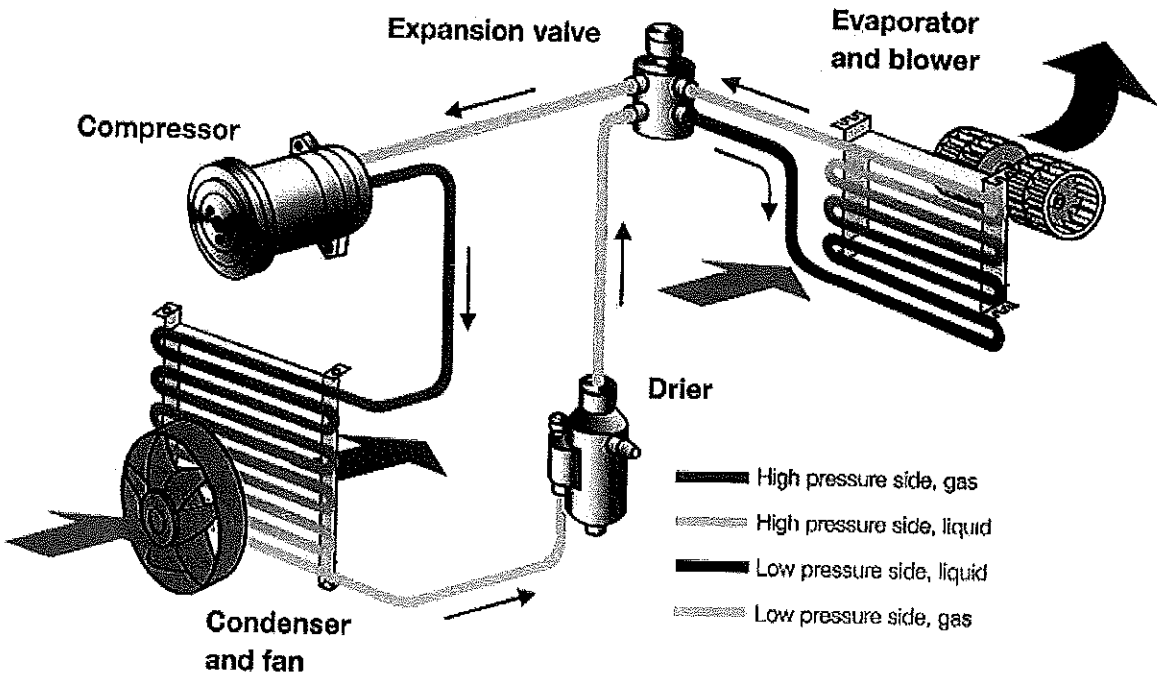
3. Vapor compression refrigeration cycle and its components are:

   Compressor: it is use to compress the refrigerant

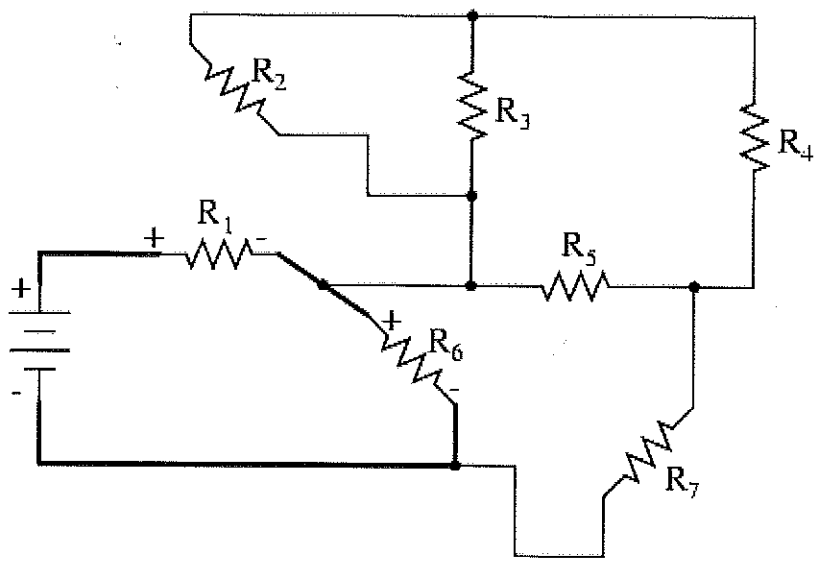
   Condenser: it is use to condense or cool of refrigerant

   Expansion valve: it is used to reduce the pressure of a refrigerant

   Evaporator: it is used to cool the compartment.



4. Mixed circuit diagram on series parallel circuit Resultant



R (Total) = 129.51 ohms.

I (Total) = 370 mA.