BSDU

Registration No: .....

SCHOOL OF AUTOMOTIVE SKILLS

FIRST END-SEMESTER EXAMINATION

WINTER SEMESTER, B.VOC. PROGRAM, SESSION: 2017-18

Course Code: AUT1001 **Time: 3 Hour**

Course Name: AUTOMOTIVE POWER TRAIN CHASSIS & SUSPENSION

Max. Marks: 100

Instructions: (1) Attempt all question from section A & section C.

(2) Attempt any six questions from section B.

Section-A

Select the one correct option from the given options in the following questions :- **10x2=20 Marks**

Q1. (I) The working cycle in case of four stroke engine is completed in following number of revolutions of crankshaft…

A) 1
B) 2
C) 4
D) 8

(II) In diesel engine, the fuel is ignited by…

A) Spark
B) Injected fuel
C) Heat resulting from compressing air that is supplied for combustion…
D) Combustion chamber

Q2. (I) Compression ratio of an IC Engine is defined as

A) Total volume/clearance volume
B) Clearance volume/ Total volume
C) Both A & B
D) None of the above

(II) Which one of the following is not an internal combustion engine?

A) 2 stroke petrol engine
B) 4 stroke petrol engine
C) Diesel engine
D) Gas turbine

Q3. (I) Full form of OEM is …

A) Original Equipment Manager
B) Original Equipment Master
C) Optional Equipment Manufacturer
D) Original Equipment Manufacture

(II) SI unit of Pressure is…

A) Pascal
B) N/mm
C) N/square mm
D) None of the above

Q4. (I) Full form of PCV is ...

A) Positive crankcase ventilation valve
B) Plus ventilation valve
C) Positive Ventilation valve
D) None of the above

(II) Full form of ECU is...

A) Engine connection unit
B) Engine control unit
C) Electrical connection unit
D) None of these

Q5. (I) Function of ABS system in a vehicle is ...

A) To avoid the instant locking of wheels
B) To prevent tires to skid
C) To provide steering balancing
D) All of the above

(II) Identify in following the components of an exhaust system...

A) Exhaust manifold
B) Muffler
C) Catalytic convertor
D) All of the above

Q6. (I) If the intake air temperature of an IC engine is lowered, the efficiency will be...

A) Increase
B) Decrease
C) Remains same
D) Both (A) & (B)

(II) For high power condition in automotive engines, the air-fuel mixture must be:

A) Lean
B) Rich
C) Chemically balanced
D) None of the above

Q7. (I) Hydraulic braking system works on the principle of...

A) Pascal law
B) Gas law
C) Both A & B
D) None of the above

(II) When brake is applied, the kinetic energy converts into...

A) Potential energy
B) Heat energy
C) Chemical energy
D) All of the above

Q8. (I) Torque wrench is used to...

A) Apply appropriate torque
B) Measure the torque
C) Both A & B
D) None of the above

(II) Purpose of brake bleeding is to...

A) Remove the air from the pipe line
B) Fill the Liquid in pipe line
C) Both A & B
D) None of the above

Q9. (I) Nipping is providing in.....

A) Helical spring
B) Torsion spring
C) Leaf spring
D) Spiral spring

(II) Effect of weak suspension is.....

A) Proper cooling of engine

C) Structural support to Automotive vehicle

B) More shock and uncontrollable riding

D) Turning of vehicle

Q10. (I) The motion of the cam is transferred to the valves through...

A) Rocker arms

C) Connecting rod

B) Piston

D) Crankcase

(II) In a diesel engine, the compression ratio is as high as...

A) 10:1

C) 7:1

B) 15:1

D) 5:1

Section-B

(6x5) = 30 Marks

Q11. Define the term automobile. Classify the IC engine and also draw a neat sketch of an IC engine.

Q12. What are the safety equipment used in mechanical shop? Write their name with their applications.

Q13. Explain four strokes Petrol engine along with a neat Sketch.

Q14. Write down at least 5 differences between single plate clutch & multiple plate clutch. (at least 5)

Q15.What are the different types of gears. Explain with the help of a figure, also mention the applications of each gear.

Q16. What is the role of differential in a vehicle? Draw a neat sketch of differential.

Q17. What is ABS? Explain major components of ABS.

Q18. Write a short note on universal joint.

Section-C

(5x10) = 50 Marks

Q19. Explain different types of Gear box used in a vehicle with the help of a sketch.

Q20. What is Hydraulic Braking System? Draw a diagram of hydraulic braking system label its components. Also explain the function of each components used in hydraulic braking system.

Q21. Explain the process of general service of a vehicle.

Q22. What is the role of suspension system in a vehicle? Expalin different type of suspension system.

Q23. Explain MPFI System. What are the advantages of MPFI System?

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Section-A

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A) 1
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C) 4
D) 8

Answer: B

(II) In diesel engine, the fuel is ignited by...

A) Spark
B) Injected fuel
C) Heat resulting from compressing air that is supplied for combustion...
D) Combustion chamber

Answer: C

Q2. (I) Compression ratio of an IC Engine is defined as

A) Total volume/clearance volume
B) Clearance volume/ Total volume
C) Both A & B
D) None of the above

Answer: A

(II) Which of the following is not an internal combustion engine?

A) 2 stroke petrol engine
B) 4 stroke petrol engine
C) Diesel engine
D) Gas turbine

Answer: D

Q3. (I) Full form of OEM is...

A) Original Equipment Manager
B) Original Equipment Master
C) Optional Equipment Manufacturer
D) Original Equipment Manufacture

Answer: D

(II) SI unit of Pressure is...

A) Pascal
B) N/mm
C) N/square mm
D) None of the above

Answer: A

Q4. (I) Full form of PCV is ...

A) Positive crankcase ventilation valve
B) Plus ventilation valve
C) Positive Ventilation valve
D) None of the above

Answer: A

(II) Full form of ECU is...

A) Engine connection unit
B) Engine control unit
C) Electrical connection unit
D) None of these

Answer: B

Q5. (I) Function of ABS system in a vehicle is ...

A) To avoid the instant locking of wheels
B) To prevent tires to skid
C) To provide steering balancing
D) All of the above

Answer: D

(II) Identify in following the components of an exhaust system

A) Exhaust manifold
B) Muffler
C) Catalytic convertor
D) All of the above

Answer: D

Q6. (I) If the intake air temperature of IC engine is lowered, the efficiency will be...

A) Increase
B) Decrease
C) Remains same
D) Both (A) & (B)

Answer: D

(II) For high power condition in automotive engines, the air-fuel mixture must be

A) Lean
B) Rich
C) Chemically balanced
D) None of the above

Answer: B

Q7. (I) Hydraulic braking system works on the principle of…

A) Pascal law
B) Gas law
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D) None of the above

Answer: A

(II) When brake is applied, the kinetic energy converts into…

A) Potential energy
B) Heat energy
C) Chemical energy
D) All of the above

Answer: B

Q8. (I) Torque wrench is used to…

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B) Measure the torque
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Answer: A

(II) Purpose of brake bleeding is to…

A) Remove the air from the pipe line
B) Fill the Liquid in pipe line
C) Both A & B
D) None of the above

Answer: A

Q9. (I) Nipping is providing in……..

A) Helical spring
B) Torsion spring
C) Leaf spring
D) Spiral spring

Answer: C

(II) Effect of weak suspension is……

A) Proper cooling of engine
B) More shock and uncontrollable riding
C) Structural support to Automotive vehicle
D) Turning of vehicle

Answer: B

Q10. (I) The motion of the cam is transferred to the valves through…

A) Rocker arms
B) Piston
C) Connecting rod
D) Crankcase

Answer: A

(II) In a diesel engine, the compression ratio is as high as.

A) 10:1
B) 15:1
C) 7:1
D) 5:1

Answer: B

Section-B

(6x5) = 30 Marks

Q11. Define term automobile. Classify the IC engine and draw a neat sketch of an IC engine.

Answer:

- An "Automobile" is a self-Propelled vehicle driven by an internal combustion engine and is used for transportation of passengers and goods on ground. E.g.: Bus, car, Jeep etc…

Classification of an IC engines: -

❖ **According to no of stroke per cycle:**

a. Two stroke cycle engines

b. Four stroke cycle engines

❖ **According to cycle of combustion:**

a. Otto cycle (Combustion at constant volume)

b. Diesel cycle (Combustion at constant pressure)

c. Dual combustion

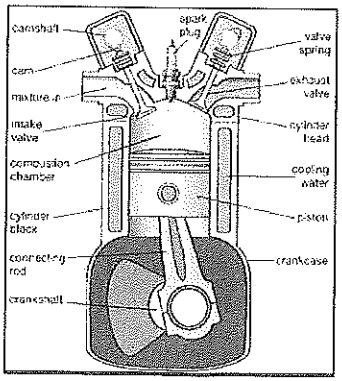
❖ **According to arrangement of cylinder:**

a. Single cylinder

b. In line or straight

c. V-engine

Neat Sketch of an IC engine:



Q12. What are safety equipment used in mechanical shop? Write its name with their application.

Answer:

Safety glasses:

If you are working in workshop then you should always wear safety glasses. Because some time stones dust particles available on wheel and when wheel is rotating then it gone into your eyes so you must wear safety glasses with side protection.

Safety gloves:

This type of glove can provide protection against some moderate concentrated chemicals. The risk of cuts and abrasions also can be minimized by wearing gloves.

Helmet:

Helmet will protect the user's head against: impact from objects falling from above, by resisting and deflecting blows to the head

Safety shoes:

A steel-toe boot is protective reinforcement in the toe which protects the foot from falling objects or compression, usually combined with a mid-sole plate to protect against punctures from below.

Q13. Explain four strokes Petrol engine along with neat Sketch.

Answer:

A **four-stroke** (also **four-cycle) engine** is an internal combustion (IC) engine in which the piston completes four separate strokes while turning the crankshaft. A stroke refers to the full travel of the piston along the cylinder, in either direction. The four separate strokes are termed:

1. Intake: also known as induction or suction This stroke of the piston begins at top dead center (T.D.C.) and ends at bottom dead center (B.D.C.). In this stroke the intake valve must be in the open position while the piston pulls an air-fuel mixture into the cylinder by producing vacuum pressure into the cylinder through its downward motion.
2. Compression: This stroke begins at B.D.C, or just at the end of the suction stroke, and ends at T.D.C. In this stroke the piston compresses the air-fuel mixture in preparation for ignition during the power stroke (below). Both the intake and exhaust valves are closed during this stage.
3. Combustion: also known as power or ignition This is the start of the second revolution of the four stroke cycle. At this point the crankshaft has completed a full 360 degree revolution. While the piston is at T.D.C. (the end of the compression stroke) the compressed air-fuel mixture is ignited by a spark plug (in a gasoline engine) or by heat generated by high compression (diesel engines), forcefully returning the piston to B.D.C. This stroke produces mechanical work from the engine to turn the crankshaft.
4. Exhaust: also known as outlet. During the *exhaust* stroke, the piston once again returns from B.D.C. to T.D.C. while the exhaust valve is open. This action expels the spent air-fuel mixture through the exhaust valve.

Q14. Write down the differences between Single plate clutch & multiple plate clutch. (at least 5)

Answer:

Single Plate Clutch	Multi-plate Clutch
As the name suggests, single plate clutch consists of a clutch plate whose both sides are coated with a frictional material.	The multi Plate clutch consists more than one clutch plate.
Torque transmitting capacity is less.	High torque transmitting capacity
Heat generation is less, so there is no need of a cooling medium. It is called "dry clutches."	Heat generation is more due to more frictional surface. So it needs a cooling medium and referred as "wet type" clutch.
The coefficient of friction is high.	The coefficient of friction is low.
Single plate clutch used where large radial space available. e.g. Trucks ,Cars	Multiple Disc clutch is used where compact construction is desirable. E.g. Motorcycle, Scooter.

Q15.What are the different type of gears. Explain with figure. Also mention the application of each gear.

Answer:

- **Spurs:** They are most common types of gears and have straight teeth.

  They are used to transmitting torque between two parallel shafts.
- **Helical:** They are used in transmitting torques between parallel or non-parallel shafts.

  They are not as noisy as spur gears
- **Bevel:** They are used to transmit rotary motion between intersecting shafts.

  They are often found where the shafts are 90 degrees apart.
- **Worm Gears:** They can be used for reducing speed and increasing torque.

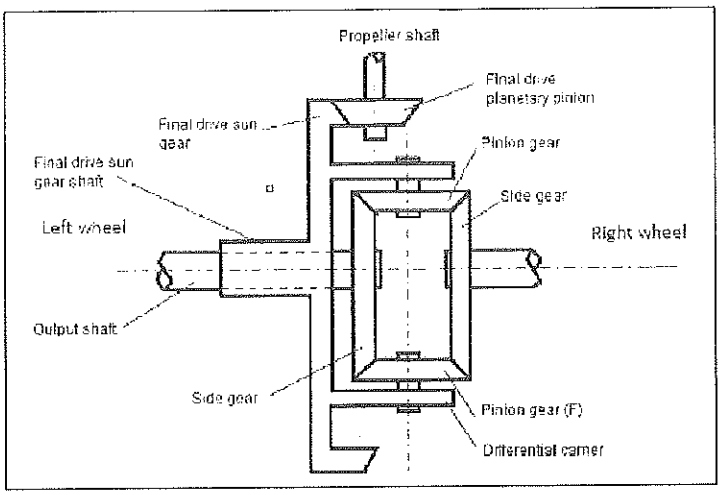
  High velocity ratio of the order of 100 can be obtained in a single step.
- **Rack and pinion:** A rack and pinion is a pair of gears which convert rotational motion into linear motion.

Q16. What is the role of differential in a vehicle? Draw a neat sketch of differential.

Answer.

Differential is a device or an equipment that comprises of gears which are attached to the drive shaft and allows the wheels to rotate at varied speeds.

- The main purpose of creating this mechanism is for driving wheels with alike force thereby allowing them to turn at different speeds.
- More specifically, differential balances the power between the left and right drive wheels at the time of cornering i.e. when inside wheels move more slowly than the outside wheels.



Q17. What is ABS? What is ABS? Explain major components of ABS.

Answer

An anti-lock braking system or anti-skid braking system (ABS) is an automobile safety system that allows the wheels on a motor vehicle to maintain tractive contact with the road surface according to driver inputs while braking, preventing the wheels from locking up (ceasing rotation) and avoiding uncontrolled skidding.

- ABS generally offers improved vehicle control and decreases stopping distances on dry and slippery surfaces; however, on loose gravel or snow-covered surfaces, ABS can significantly increase braking distance, although still improving vehicle steering control.

Component:

- There are four main components of ABS: wheel speed sensors, valves, a pump, and a controller.
- **Speed sensors:** A speed sensor is used to determine the acceleration or deceleration of the wheel. A wheel speed sensor or vehicle speed sensor (VSS) is a type of tachometer. It is a sender device used for reading the speed of a vehicle's wheel rotation.

Q18. Write short note on universal joint.

Answer: Universal joint Allow for angle changes between the drive shaft, the transmission output shaft, and the rear axle housing

Section-C

(5x10) = 50 Marks

Q19. Explain different types of Gear box used in vehicle? (Sketch)

Answer: **Manual gear boxes**

1. Sliding Mesh Gear box
2. Constant Mesh Gear box
3. Synchromesh Gear box

- **Automatic gear boxes**
    1. Over drive (semi-automatic)
        - Fluid drive or Fluid coupling
    2. Fully automatic
        - Epicyclic gear box
        - Free Wheeling unit
        - Torque Convertor

- **Construction and working of sliding mesh gear box**
- Sliding mesh gear boxes are made with spur gear. The gears in the layshaft is rigidly fixed shaft. The gears in main shaft alone can move along the spline. The selector fork moves the gear and moves the perfect mesh with the required gear in lay shaft when the gear lever is shifted. An idler gear is provided for reverse gearing. Thus the power form the clutch shaft is transmitted to the main shaft through the lay shaft.

Construction and working of a constant mesh gear box:

1. **Counter shaft or Lay Shaft:**

This shaft is in direct contact with the clutch and the main shaft.

2. Main shaft:

This shaft operates the speed of the vehicle. The power is made available to the main shaft through the gears from the counter shaft. This is done with the gear ratio.

3. Dog clutch:

Dog clutch is special feature of constant mesh gearbox. It is used for the coupling of any two shafts. This is done by interference. Using a dog clutch, various gears can be locked to the output and input shafts.

4. Gears:

The main work of the gears is the transmission of power between the shafts.

Q20. What is hydraulic Braking system? Draw a diagram of hydraulic braking system with their components. Also explain the function of each components used in hydraulic braking system.

Answer:

- Hydraulic Braking System is the System Which used Hydraulic Fluid to build up the pressure for Braking Action.
- Hydraulic brake works on Pascal law.
- **Pascal law-** Pascal's law is a principle of fluid mechanics that states that a pressure change occurring anywhere in a confined incompressible fluid is transmitted throughout the fluid such that the same change occurs everywhere.

There are two types of Hydraulic Braking System:

- Expanding Drum Type Hydraulic Brake
- Disc Type Hydraulic Brake

Components:

- Master Cylinder is heart of Hydraulic Braking System.
- It pressurized the braking fluid which is in reservoir to actuate the wheel cylinder for braking system. Tandem Master Cylinder: It is the latest development in hydraulic braking system.
- It Reduces Risk of Brake failing.
- There are two Different section in tandem master cylinder for pressurized the brake fluid.
- Fluid Pipe: When the driver presses the brake pedal, hydraulic pressure is generated in the master brake cylinder. So that a braking force can be produced from this, the hydraulic pressure must be transmitted to the wheel brakes Line:

Q20. What is hydraulic Braking system? Draw a diagram of hydraulic braking system with their components. Also explain the function of each component used in hydraulic braking system.

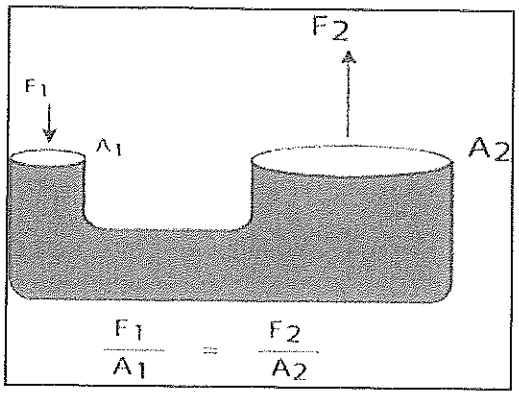
Ans.

- Hydraulic Braking System is the System Which used Hydraulic Fluid to build up the pressure for Braking Action.
- Hydraulic Braking System is the System Which used Hydraulic Fluid to build up the pressure for Braking Action.

WORKING PRINCIPLE OF HYDRAULIC BRAKING SYSTEM

- Hydraulic brake works on pascal law.

- **Pascal law-** Pascal's law is a principle of fluid mechanics that states that a pressure change occurring anywhere in a confined incompressible fluid is transmitted throughout the fluid such that the same change occurs everywhere.



COMPONENTS OF HYDRAULIC BRAKING SYSTEM

- Foot Pedal: Foot pedals are levers that are activated by the driver's feet to control certain aspects of the vehicle's operation.
- Master Cylinder is heart of Hydraulic Braking System.
- It pressurized the braking fluid which is in reservoir to actuate the wheel cylinder for braking system.
- Tandem Master Cylinder: It is the latest development in hydraulic braking system.
- It Reduces Risk of Brake failing.
- There are two Different section in tandem master cylinder for pressurized the brake fluid.
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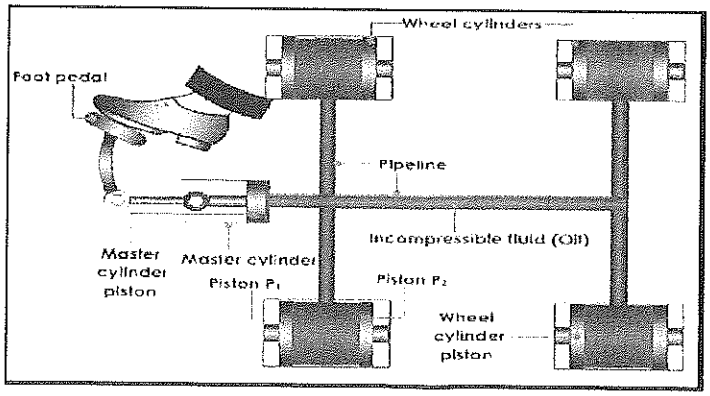


Q21. Explain the process of general service of a vehicle.

Answer: The engine service includes:

- Engine oil change
- Oil filter /Air filter change
- Cooling system maintenance
- Spark plug/fuel injector check
- Timing chain service
- Sealing /gasket check
- Internal parts like piston rings, bearings, and valve train components check
- Engine removal and installation
- **Run your engine**

Since warm oil drains faster than cold, run your engine for only a couple of minutes.

- **Lift your car onto two post lift.**

Lift your car on suitable height. Put on your safety glasses and gloves.

- **Locate the oil drain plug and place the oil pan below it.**

Consult your owner's service manual for help in locating the oil drain plug.

- **Unscrew the plug with a socket wrench.**

While unscrewing it, push the plug back toward the pan to keep oil from rushing out until you are ready to remove the plug from the hole. Be careful-that the oil may be hot.

- **Replace oil plug.**

Even after you've drained the oil, replace and tighten the oil plug with a wrench.

- **Remove existing oil filter.**

Even after you drained the oil, the old oil filter still contain hot oil. Use oil filter wrench to remove the filter.

- **Lubricate the new filter and screw into place by oil filter wrench.**

It's usually not necessary to tighten the oil filter with the wrench, but check the filter's instruction to be sure.

- **Pour in new oil.**

Make sure to use clean funnel, and pour in the amount and type of oil specified for your vehicle.

➢ **Run the engine and look for leaks.**

After you run the engine for few minutes, check the area around the oil drain plug and filter for leaks.

➢ **Check the oil level.**

Remove the dipstick, wipe it off and replace it. Then remove it again to see if it's up to the "full mark" if it's not full add the balance of the oil.

➢ **Dispose of old oil and oil filter properly.**

The both to either authorized used engine oil drop-off center or recycling center to recycle the old oil.

Q22. What is the role of suspension system in a vehicle? Expalin different types of suspension system.

Answer: **Suspension** is the system of tires, tire air, springs, shock absorbers and linkages that connects a vehicle to its wheels and allows relative motion between the two.[1] Suspension systems must support both road holding/handling and ride quality,[2] which are at odds with each other. The tuning of suspensions involves finding the right compromise. It is important for the suspension to keep the road wheel in contact with the road surface as much as possible, because all the road or ground forces acting on the vehicle do so through the contact patches of the tires. The suspension also protects the vehicle itself and any cargo or luggage from damage and wear. The design of front and rear suspension of a car may be different.

Types of suspension system: -

Suspension systems are divided into three categories

1. Dependent
2. Semi Independent and
3. Independent suspension system

Q23. Explain MPFI System? What are the advantages of MPFI System?

Ans.

The MPFI is a system or method of injecting fuel into internal combustion engine through multi ports situated on intake valve of each cylinder. It delivers an exact quantity of fuel in each cylinder at the right time. There are three types of MPFI systems – Batched, Simultaneous and Sequential.

In the batched MPFI system fuel is injected to the groups or batches of the cylinders without bringing their intake stroke together. In the simultaneous system, fuel is inserted to all cylinders at the same time, while the sequential system injection is timed to overlap with intake stroke of each cylinder.

MPFI includes a fuel pressure regulator, fuel injectors, cylinders, pressure spring and a control diaphragm. It uses multiple individual injectors to insert fuel in each cylinder through intake port situated upstream of cylinder's intake value. The fuel pressure regulator, connected to the fuel rail by means of an inlet and outlet, directs the flow of the fuel. While the control diaphragm and pressure spring controls the outlet valve

opening and the amount of fuel that can return. The pressure in the intake manifold significantly changes with the engine speed and load.

Advantages of multi point fuel injection system?

The multi-point fuel injection technology improves fuel efficiency of the vehicles. MPFI uses individual fuel injector for each cylinder, thus there is no gas wastage over time. It reduces the fuel consumption and makes the vehicle more efficient and economical.

The vehicles with MPFI automobile technology have lower carbon emissions than a few decades old vehicles. It reduces the emission of the hazardous chemicals or smoke, released when fuel is burned. The more precise fuel delivery cleans the exhaust and produces less toxic byproducts. Therefore, the engine and the air remain cleaner.

MPFI system improves the engine performance. It atomizes the air in small tube instead additional air intake, and enhances the cylinder-to-cylinder fuel distribution that aid to the engine performance.

It encourages distribution of more uniform air-fuel mixture to each cylinder that reduces the power difference developed in individual cylinder.

Registration No:.....

SCHOOL OF AUTOMOTIVE SKILLS

FIRST END-SEMESTER EXAMINATION – 2018

WINTER SEMESTER, B. VOC. PROGRAM

Course Code: AUT1002 Time: 3 Hour

Course Name: AUTOMOTIVE WHEEL CARE & STEERING SYSTEM Max. Marks: 100

Instructions: (1) Attempt all question from section A & section C.

(2) Attempt any six questions from section B.

Section-A

Select the one correct option from the given options in the following questions :- (10x2) = 20 Marks

Q1. (I) Which type of bearing is used in wheel assembly?

A) Roller bearing B) Ball bearing

C) Tapper roller bearing D) Self aligning bearing

(II) Function of Steering system is to.....

A) Removing vibration B) Locking wheel

C) Guide the vehicle D) None of these

Q2. (I) What is the full form of TPMS?

A) Tyre pressure monitoring sensor B) Tyre Pressure maintenance sensor

C) Tyre pressure master cylinder D) Tyre puncture management sensor

(II) Select any two suitable processes for removing tyre wear & vibration problem:

A) Wheel alignment B) Tyre changing

C) Wheel balancing D) None of these

Q3. (I) What is the full form of OEM?

A) Original equipment manager B) Original equipment master

C) Optional equipment manufacturer D) Original equipment manufacturer

(II) How many kinds of counter weight are used for wheel balancing?

A) 4 B) 6

C) 2 D) 3

Q4. (I) How many universal joints are used in steering system?

A) 2 B) 3

C) 1 D) 4

(II) How many kinds of steering system are used?

A) 1 B) 2

C) 4 D) 3

Q5. (I) Function of tread in a tyre is:

A) To give better look B) To Provide friction

C) To give structural support D) To improve strength

(II) Main function of the steering pump is:

A) To provide load B) To provide force

C) To provide pressure D) None of these

Q6. (I) Material of the car wheel is:

A) Plastic B) Wood

C) Pressed steel disk D) Copper

(II) During tyre changing which liquid is applied on the tyres:

A) Tyre lube B) Diesel

C) Oil D) Grease

Q7. (I) Which two of the following types of suspension system generally we are used in vehicles?

A) Dependent suspension B) Independent suspension

C) Air suspension D) Dry suspension

(II) Which mechanism is used for bead breaking in tyre changer machine?

A) Electrical B) Mechanical

C) Pneumatic D) None of these

Q8. (I) Which type of plier is used to mount counter weight?

A) Pincers B) Needle nose pliers

C) Lineman's Pliers D) Weight plier

(II) Which material is used to make tyre bead wire?

A) Rubber B) Copper wire

C) Aluminium D) High-strength steel

Q9. (I) Where is the bead located in the tyre?

A) At Surface

B) On edges

C) On side walls

D) Inner side

(II) Function of groove in tyre is to:

A) Better look

B) Air or water flow

C) To Give structural support

D) None of these

Q10. (I) Which one of the following temperature is best to use summer tyre?

A) Below +8°C

B) Above + 8°C

C) Above +7°C

D) Below +7°C

(II) Which one is not a part of suspension system?

A) Stabilizer bar

B) Tie rode

C) Coil spring

D) Body

Section-B

(6x5) = 30 Marks

Q11. Write briefly about components of a tyre.

Q12. What are the safety equipment used in wheel care section?

Q13. Write the name of tyres based on their applications Also explain run-flat tyre.

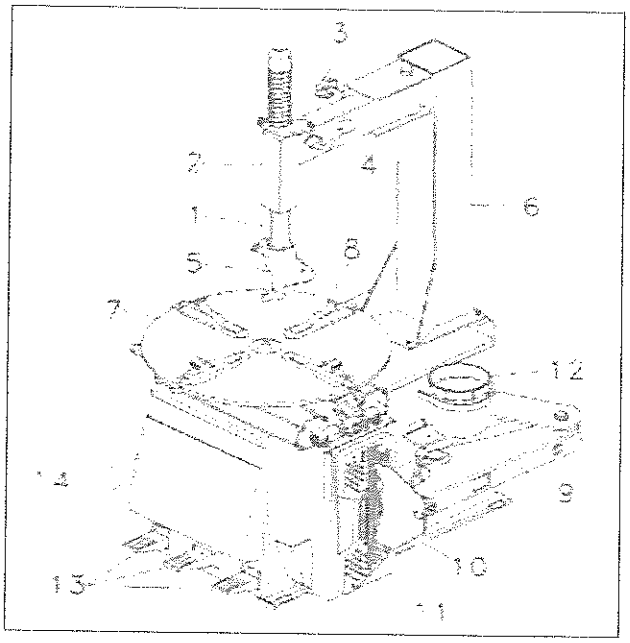
Q14. Write a short note on tyre nomenclature.

Q15. What is the process of wheel bearing maintenance?

Q16. Describe briefly about the components of a steering system of an automobile.

Q17 Describe briefly about components of suspension system.

Q18. Identify the tyre changer components in the figure given below:



Section-C

(5x10) = 50 Marks

Q19. Explain caster, camber and toe angles with the help of diagrams.

Q20. What is wheel balancing? What are the advantages of wheel balancing?

Q21. Explain the role & responsibilities of a wheel care technician in an automotive workshop.

Q22. Explain the standard process of wheel alignment process write its advantages.

Q23. Discuss the different types of seasonal tyre along with the differences based on their applications.

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Registration No:.....

SCHOOL OF AUTOMOTIVE SKILLS

FIRST END-SEMESTER EXAMINATION – 2018

WINTER SEMESTER, B. VOC. PROGRAM

Course Code: AUT1002 Time: 3 Hour

Course Name: AUTOMOTIVE WHEEL CARE & STEERING SYSTEM Max. Marks: 100

Instructions: (1) Attempt all question from section A & section C.

(2) Attempt any six questions from section B.

Section-A

Select the one correct option from the given options in the following questions :- (10x2) = 20 Marks

Q1. (I) Which type of bearing is used in wheel assembly?

A) Roller Bearing B) Ball Bearing

C) Tapper Roller Bearing D) Self Aligning Bearing

Answer: C

(II) Function of Steering system is to.....

A) Removing Vibration B) Locking wheel

C) Guide the Vehicle D) None of These

Answer: C

Q2. (I) What is the full form of TPMS?

A) Tyre Pressure Monitoring Sensor B) Tyre Pressure Maintenance Sensor

C) Tyre Pressure Master Cylinder D) Tyre Puncture Management Sensor

Answer: A

(II) Select any two suitable Processes for removing tyre wear & vibration problem:

A) Wheel Alignment B) Tyre Changing

C) Wheel Balancing D) None of These

Answer: A & C

Q3. (I) What is the full form of OEM?

A) Original Equipment Manager

B) Original Equipment Master

C) Optional Equipment Manufacturer

D) Original Equipment Manufacturer

Answer: A

(II) How many kinds of counter weight are used for wheel balancing?

A) 4

B) 6

C) 2

D) 3

Answer: C

Q4. (I) How many universal joints are used in steering system:

A) 2

B) 3

C) 1

D) 4

Answer: A

(II) How many kind of steering system are used:

A) 1

B) 2

C) 4

D) 3

Answer: B

Q5. (I) Function of tread in a tyre is:

A) To give better look

B) To Provide friction

C) To give structural support

D) To improve strength

Answer: B

(II) Main function of the steering pump is:

A) To provide load

B) To provide force

C) To provide pressure

D) None of these

Answer: C

Q6. (I) Material of the car wheel is:

A) Plastic

B) Wood

C) Pressed steel disk

D) Copper

Answer: C

(II) During tyre changing which liquid is applied on the tyres:

A) Tyre lube
B) Diesel
C) Oil
D) Grease

Answer: A

Q7. (I) Which type of suspension system generally used in the vehicle select any two:

A) Dependent Suspension
B) Independent Suspension
C) Air Suspension
D) Dry Suspension

Answer: A & B

(II) Which mechanism is used for bead breaking in tyre changer machine?

A) Electrical
B) Mechanical
C) Pneumatic
D) None of these

Answer: C

Q8. (I) Which type of plier is used to mount counter weight?

A) Pincers
B) Needle nose pliers
C) Lineman's Pliers
D) Weight plier

Answer: D

(II) Which material is used to make tyre bead wire?

A) Rubber
B) Copper wire
C) Aluminium
D) High-strength steel

Answer: D

Q9. (I) Where is the bead located in the tyre?

A) At Surface
B) On edges
C) On side walls
D) Inner side

Answer: B

(II) Function of groove in tyre is to:

A) Better look
B) Air or Water Flow
C) To Give Structural Support
D) None of these

Answer: B

Q10. (I) What is the best temperature to use summer tyre?

A) Below +8°C

B) Above + 8°C

C) Above +7°C

D) Below +7°C

Answer: C

(II) Which one is not a part of suspension system?

A) Stabilizer Bar

B) Tie Rode

C) Coil spring

D) Body

Answer: D

Section-B

(6x5) = 30 Marks

Q11. Write briefly about components of a tyre.

Answer:

- **Tire Belts**

Rubber-coated layers of steel, fiberglass, rayon, and other materials located between the tread and plies, crisscrossing at angles, hold the plies in place. Belts provide resistance to punctures and help treads stay flat and in contact with the road.

- **Tire Sipes**

Sipes are special treads within the tread that improve traction on wet, dirty, sandy, or snowy road surfaces.

- **Tire Tread**

The portion of the tire that comes in contact with the road.

- **Tire Grooves**

The spaces between two adjacent tread ribs are also called tread grooves. These allow water to escape effectively.

- **Tire Shoulder**

The outer edge of the tread that wraps into the sidewall area.

- **Tire Sidewall**

The sidewall of the tire protects cord plies and features tire markings and information such as tire size and type.

- **Tire Inner Liner**

This is the innermost layer of a tubeless tire that prevents air from penetrating the tire.

- **Tire Bead**

A rubber-coated loop of high-strength steel cable that allows a tire to stay "seated" on a rim.

- **Tire Body Plies**

This is the tire itself, made up of several layers of plies. 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.

Q12. What are the Safety Equipment used in wheel care section?

Answer:

Safety glasses:

If you are working in workshop then you should always wear safety glasses. Because some time stones dust particles available on wheel and when wheel is rotating then it gone into your eyes so you must wear safety glasses with side protection.

Safety gloves:

This type of glove can provide protection against some moderate concentrated chemicals. The risk of cuts and abrasions also can be minimized by wearing gloves.

Helmet:

Helmet will protect the user's head against: impact from objects falling from above, by resisting and deflecting blows to the head

Safety shoes:

A steel-toe boot is protective reinforcement in the toe which protects the foot from falling objects or compression, usually combined with a mid-sole plate to protect against punctures from below.

Q13. Write the name of tyres based on their applications also explain run-flat tyre.

Answer:

- Run-flat.
- Racing.
- Light trailer.
- Heavy duty truck.
- Off-the-road.
- Agricultural and off-road flotation tires.
- Industrial.
- Aircraft.

- Motorcycle.

➢ **Run-flat.**

- Run flat tyres are designed in such a way to remain operational in the event of a puncture or a severe loss of air pressure allowing you to make it to safety, be that so you can return home or to your nearest tyre fitter.
- Run flat tyres also reduce the risk of tyre blow outs which could be dangerous and a risk to the safety of the driver and other road users if they occur at speed.

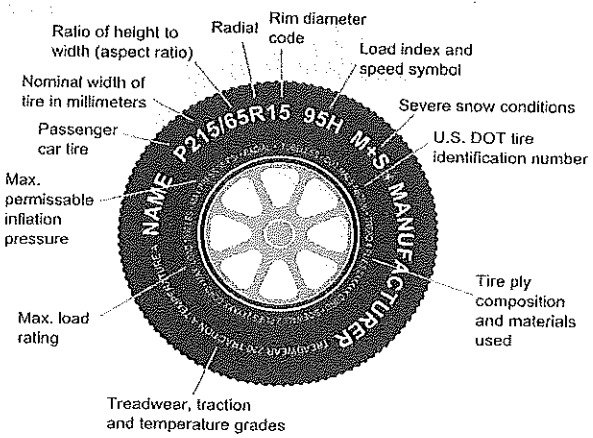
How run flat tyres work:

- Run flat tyres have much thicker, reinforced sidewalls which means they can be driven on for a short time after picking up a puncture. The tyre can temporarily maintain its shape and strength even in the event of a total loss of air pressure.
- Run flat tyres have obvious safety benefits as the tyre is still able to be driven on in the event of a puncture allowing you, the driver, to stay in control of the vehicle. This isn't to say run flat tyres do not need air and in the unfortunate event of a puncture you should seek help as soon as possible. It is advised that you should travel no more than 50 miles on a punctured run flat tyre.

Q14. Write short note on Tyre Nomenclature.

Answer:

The sidewall of typical tyre is imprinted with myriad codes and numbers that are used to identify the size and physical features of that tyre as well as details relating to its manufacture. Many of these tyre markings are of little or no importance to the driver while others are essential when it comes to choosing a replacement tyre.



If you are looking for new tyres you should familiarize yourself with the following tyre markings.

- Tyre Size
- Speed Rating

- Load Index
- Date of Manufacture
- Reinforced
- Run Flat
- Homologation

Q15. What is the process of wheel bearing maintenance?

Answer:

- Step 1. Prepare the vehicle
- Step 2. Remove wheel and brake unit
- Step 3. Removing The Bearing Hub Assembly

Remove the dust cap and remove the locking device. This is usually a cotter pin through the nut & spindle.

- Step 4. Remove hub seal

Using a long dowel pin or drift & using a hammer, gently drive on the front of the inner hub bearing from inside the hub unit.

- Step 5. Clean and Check the Oil Bearing

Use a paper towel to wipe all of the old bearing grease from the spindle and the hub dust cap.

Clean the bearing with solvent & air dry on a paper towel or blow it dry with compressed air.

- Step 6. Inspect The Bearing

Inspect the bearing and it's housing, which is called the "Bearing Race," for damage.

IF you see any pitting or damage, replace all the bearing set .

- Step 7. Re-pack Grease Into Bearing

Check your shop manual to see which grease is recommended for the vehicle and its application. The most common method is to pack the bearings by hand.

- Step 8. Grease Inside of The Hub and Dust Cap

Put a small amount of grease in the cavity of the hub.

Also pack some grease into the dust cap. Fill it about one-third, not all the way up.

- Step 9. Re-install The Bearing and Seal

Re-install the bearing in the same bearing race. Leave a ring of grease below the bearing race to help keep the fresh grease inside the bearing area after it heats up.

Step 10. Inspect the Sealing Area of The Spindle

Inspect the sealing area of any sings of wear or damage. If the seal area is worn or grooved.

Step 11. Re-install Bearing Hub Assembly

Slide the hub assembly onto the spindle and ensure it site on the sealing area.

Put the outer bearing in place.

Q16. Write briefly about the components of a steering system of an automobile.

- **Answer:** Steering Wheel
- Steering Column & Shaft
- Universal Joint
- Steering Gear Box
- Steering Pump
- Linkage (Tie Road)
- Rubber Bush

Steering Wheel

- Steering wheels are used in most modern vehicles like buses, light and heavy trucks, and tractors.

Steering Column & Shaft

- The automotive **steering column** is a device intended primarily for connecting the steering wheel to the steering mechanism or transferring the driver's input torque from the steering wheel.

Universal Joint

- In most cars with an intermediate steering shaft, there are two u-joint couplings.
- The top u-joint connects the intermediate shaft to the steering column.
- The lower u-joint connects the intermediate shaft to the steering rack.

Steering Gear Box

- The steering gearbox contains the gears that transmit the driver's steering inputs to the steering linkage that turns the wheels, and it multiplies the driver's steering changes so that the front wheels move more than the steering wheel.

Steering Pump

- The hydraulic power for the steering is provided by a **rotary-vane pump**

oil reservoir

- The oil reservoir sends the oil to the power steering pump and receives the oil from the power steering gear.

Steering linkage

- **Steering linkage** is the part of an automotive steering system that connects to the front wheels.

Q17 Write Briefly about components of suspension system.

Answer:

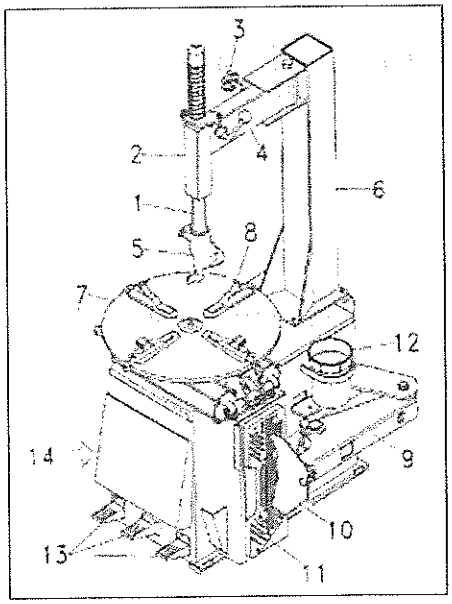
Control arm: In automotive suspensions, a suspension link, control link or link is a suspension member, that attaches at only two points. One point being the body or frame of the vehicle and the other point attaching to the knuckle, upright, axle or another link. The link pivots on either a bushing or a ball joint at each attachment point. A link differs from a control arm because it can only control one of the degrees of freedom by itself.

Steering knuckle: It provides a spindle or bearing support for the wheel hub, bearing and assembly.

Ball Joint: An automobile, ball joints are spherical bearings that connect the control arms to the steering knuckles.

Spring: It Supports the weight of the vehicle, permits the control arm and wheel to move and down.

Q18. Identify the tyre changer components in the figure given below:



Answer:

1. Vertical slide
2. Swing arm
3. Adjustable knob
4. Lock lever
5. Mount/ demount head

6. Tower or column
7. Turntable
8. Jaw or clamp
9. Bead breaker arm
10. Bead breaker blade
11. Bead breaker pads
12. Lube pail
13. Foot pedal controls
14. Bead seater/ inflator pedal

Section-C

(5x10) = 50 Marks

Q19. Explain Caster, caster and Toe Angle with the help of Diagrams.

Answer:

Caster

- This angle shows the forward or backward slope of a line drawn through the upper and lower steering pivot points, when viewed directly from the side of the vehicle.
- Also expressed in degrees, caster is measured by "comparing a line running through the steering system's upper and lower pivot points to a line drawn perpendicular to the ground,"

Camber:

- This suspension angle shows how the tire angles away from 0 degrees vertical when viewed from either the front or rear of the vehicle. Expressed in degrees, negative camber means the top of the tire tilts toward the centre of the vehicle, while positive camber means the top of the tire tilts away from centre.
- A visual cue for a camber problem is excessive tire wear on the inner or outermost ribs.

Toe:

- Identifies the direction tires are pointed relative to the centreline of the vehicle, when viewed from directly above. Toe can be expressed in either degrees or fractions of an inch.

Q20. What is Wheel Balancing? Also write the advantages of wheel balancing.

Answer: Put safety first.

Before you can begin to do anything, make sure you are protected by wearing some safety equipment. Make sure you are wearing steel toes boots, long pants, safety glasses or goggles, and gloves.

Step 2: Ensure you have proper tires.

Make sure the tyres that you have on the rims are good for the road. No cracks on the sidewall, and to have at least (50%) of tread depth.

Step 3: Make sure you have no centre caps and wheel weights.

Before mounting the wheel onto the machine, make sure you have your centre caps off (if you have them), and the old wheel weights from the previous balancing off. This is to ensure that you get the most accurate results from the machine.

Step 4: Mount the wheel.

After you have done all the previous steps, you can now safely mount your wheel onto the machine. Once it is on, double check to make sure that the wheel is snug tight

Step 5: Measure the wheel.

Once the wheel is on, the machine will want to know the size of the rim. You will have to measure the height of the rim, as well as the width

Step 6: Select your vehicle.

Depending on the machine you're using, it may have a feature which allows you to choose what type of vehicle this wheel will be going on so it can put the proper amount of road force when it's being tested.

Step 7: Enter proper tire pressure accordingly to your vehicle specifications.

If you don't do this before closing down the hood, it will ask you if you have done it or not to be a reminder.

Step 8: Start.

Once you have measure your rims and have chosen the proper type of vehicle, you can simply presses start or close the hood.

Step 9: Install wheel weights.

Once the machine has finished testing the road force and balance the wheel, it will tell you how much weight it wants and what side of the wheel.

Step 10: Rebalance.

Once you have install the wheel weights, you want to rebalance the wheel to make sure you added the proper amount of the wheel weights, and at the proper spot of the rim it has asked.

Step 11: Finish up.

This means now your wheel is balanced.

Q21. Explain the role & responsibilities of a wheel care technician in a automotive workshop.

Answer:

- An automotive service technician (or auto mechanic) is someone who inspects, maintains, repair and replace like tyre brake etc.
- Test parts and systems to ensure they are working properly
- Identify mechanical problems, often by using computerized diagnostic equipment
- Follow checklists to ensure that all critical parts are examined
- Perform basic care of tyre rotations
- Repair or replace worn parts, such as brake pads and wheel bearings
- Disassemble and reassemble parts
- Use testing equipment to ensure that repairs and maintenance are effective
- Explain to clients their automotive problems and the repairs done on their vehicles.

Q22. Explain the standard process of wheel alignment on an automobile also write its advantages.

Answer:

Total Wheel Alignment Process

- Step 1: Depending on your alignment equipment, enter the vehicle year, make, model and design into the system's computer to determine the **OEM (Original equipment manufacturer)** alignment specifications.
- Step 2: Next, drive the vehicle onto your alignment rack.
- Step 3: Next, check and adjust tire pressures to OEM Remove hubcaps if present.
- Step 4: Mount targets to wheel ends as required by the rack manufacturer.
- Step 5: Depending on your alignment equipment and system, there are unique procedures that will measure the current camber, caster and toe angles of the vehicle and report that information either on a print-out or on a diagnostic screen.
- Step 6: If the rear alignment needs to be adjusted, this has to be performed before working on front-end adjustments.
- Step 7: With front-end alignments, correct caster and camber adjustments first.
- Step 8: With caster and camber adjusted, then adjust toe angles.
- Step 9: Restart the car, remove the steering wheel lock, turn the steering wheel back and forth a couple times, then re-centre and replace the steering wheel lock. Recheck alignment specifications, and then readjust angles as necessary.
- Step 10: Remove the alignment heads and lower the vehicle.
- Step 11: Complete the alignment by taking a test drive to ensure any previously noted symptoms are gone or can be attributed to other vehicle issues.

Advantages:

- Reduce tyre wear
- Reduce steering effort
- Save tyre cost
- Reduce steering maintenance cost
- Etc..

Q23. Discuss the different types of season tyre along with the differences based on their application.

Answer:

Summer Tyres:

- Summer tyres are designed to work best during the warmer summer months.
- They are created with a specific tread pattern for optimal performance on both dry and wet roads when the air temperature is above +7°C.

Advantages	Disadvantage
Better mileage	Stopping distances is high
Reduced fuel consumption	Less safe compare to winter tyre
Improved driver comfort	
Reduced noise	

Winter Tyres:

- Winter tyres look very similar to summer tyres but are specially developed to provide additional driving performance in winter conditions. It is a common misconception that winter tyres are only for driving in the snow.

- Winter tyres are designed to work best in conditions below +7°C, so even in wet and icy conditions, you'll benefit from their superior grip and handling.

- **Advantages**

  - Shorter stopping distances
  - Safety and improved performance
  - Grip in snow, and wet conditions

All Season Tyres:

All season tyres essentially combine elements of summer tyres and winter tyres.

- To create a tyre that has benefits of both so that they can be used all-year round, giving drivers peace of mind whatever the weather throws at them.
- While all season car tyres are not likely to match the performance of specialist summer or winter tyres during these respective seasons, they provide a good all-round mix of strengths.

Advantage

Avoid the cost changing between summer and winter tyres.

Not required to Purchasing two sets of tyres.

Finish storing multiple sets of tyres

Registration No: .....

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SCHOOL OF AUTOMOTIVE SKILLS

FIRST END-SEMESTER EXAMINATION – 2018

WINTER SEMESTER, B. VOC. PROGRAM

Course Code: AUT1003 **Time: 3 Hours**

Course Name: AUTOMOTIVE BODY REPAIR **Max. Marks: 100**

Instructions: 1.) Attempt all questions from Section-A & Section-C

2.) Attempt any six questions from Section-B

Directions: Select any one correct answer from the given options:

Section-A **(20x1=20) Marks**

1) (I) Which one of the following is forming process?
   a) Slitting
   b) Perforating
   c) Parting
   d) Drawing

   (II) A structure design in which the frame and body are built as a single integrated structure is called.....
   a) Backbone
   b) Monocoque
   c) Ladder
   d) All of the above

2) (I) Select Destructive type testing methods:
   a) Visual Inspection
   b) X-ray Testing
   c) Tensile Testing
   d) Dye Penetration testing

   (II) Sheet metal used for decorative uses is .....
   a) Brass
   b) Silver
   c) Steel
   d) Aluminium

3) (I) Which one of the following joint has high corrosion resistance?
   a) Welding joint
   b) Bolted joint
   c) Riveted joint
   d) None of the above

   (II) Which one of the following types is not fillet weld?
   a) Butt joint
   b) Lap joint
   c) T-joint
   d) Corner joint

4) (I) The heat generated (Q) in resistance welding is expressed by:
   a) $Q = I^2R\,T$
   b) $Q = IR^2\,T$
   c) $Q = IRT^2$
   d) $Q = 2IRT$

   (II) The gap between the electrode rod and the work piece should be about .....
   a) the electrode diameter
   b) 5 mm
   c) the work piece thickness
   d) the core wire diameter

5) (I) For gas tungsten arc welding..... electrode is used.
   a) Consumable
   b) filler
   c) Non-consumable
   d) None of the above

(II) The deposition rate of TIG welding is very high.

a. True
b. False
c. Both (a) & (b)
d. None of the above

6) (I).....is a machine that changes the shape of a work piece by the application of pressure.

a) Dent puller
b) Grinder
c) Press machine
d) Lathe machine

(II) Which one of the following isn't a forming process?

a) Slitting
b) Stretching
c) Bending
d) All of the above

7) (I) Plasma is a state of matter consisting of..... gas.

a) Hydrogen
b) Nitrogen
c) Carbon dioxide
d) Ionized

(II) Plasma Cutting operates at a temperature of .....°C

a) 1000°C- 1500°C
b) 10000°C- 30000°C
c) 1600°C- 2500°C
d) More than 450000°C

8) (I) .....is an example of inert gas.

a) Hydrogen
b) Oxygen
c) Helium
d) Carbon dioxide

(II) ..... is an example of active gas.

a) Helium
b) Argon
c) Neon
d) Hydrogen

9) (I) Extremely thin sheets are considered as .....

a) Foil
b) Steel
c) plate
d) None of the above

(II) Punching a number of holes in a sheet is known as.....

a) Blanking
b) Slitting
c) Perforating
d) Drawing

10) (I) A shallow deformation in the surface of an object, produce by an impact is known as.....

a) Scratch
b) Dent
c) Hole
d) All of the above

(II) The dent which can be removed without any damage of vehicles paints are known as.....

a) Ding
b) Extreme Dent
c) Scratch
d) Creased Dent

Section-B (6x5=30) Marks

11) What are the requirements of Body Shop in an automotive workshop?
12) Define brazing and soldering. Write the differences between them.
13) Briefly describe the protective equipment used in welding along with their functions.
14) What are the characteristics of electrode coating?
15) List the different types of weld joints along with their diagrams.
16) Write the different types of automotive body style with examples.
17) Write short notes on:

a) Ladder Chassis b) Monocoque Chassis

18) Explain the process of dent removal.

Section-C **(5x10=50) Marks**

19) Explain the weld seam inspection procedures in detail.

20) Discuss the working principle of Resistance Spot Welding.

21) Explain the Gas Shielded Arc Welding and also mention its applications.

22) Describe the principle of plasma cutting process.

23) Describe the different types of sheet metal processes.

ANSWER SHEET

SCHOOL OF AUTOMOTIVE SKILLS

FIRST END-SEMESTER EXAMINATION – 2018

WINTER SEMESTER, B. VOC. PROGRAM

Course Code: AUT1003 **Time: 3 Hours**

Course Name: AUTOMOTIVE BODY REPAIR **Max. Marks: 100**

Instructions: Attempt all questions.

Directions: Select any one correct answer from the given options:

Section-A **(20x1=20) Marks**

1) (I) Which of the following is forming process?

a) Slitting
b) Perforating
c) Parting
d) Drawing

Ans: - d)

(II) A structure design in which the frame and body are built as a single integrated structure is called……..

a) Backbone
b) Monocoque
c) Ladder
d) All of the above

Ans: - b)

2) (I) Select Destructive type testing methods:

a) Visual Inspection
b) X-ray Testing
c) Tensile Testing
d) Dye Penetration testing

Ans: - c)

(II) Sheet metal used for decorative uses is ……

a) Brass
b) Silver
c) Steel
d) Aluminium

Ans: - b)

3) (I) Which of the following joint have high corrosion resistance?

a) Welding joint
b) Bolted joint
c) Riveted joint
d) None of the above

Ans: - a)

(II) Which of the following types is not fillet weld?

a) Butt joint
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c) T-joint
d) Corner joint

Ans: - a)

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Ans: - a)

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d) the core wire diameter

Ans: - d)

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a) Consumable
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Ans: - c)

(II) The deposition rate of TIG welding is very high.

a. True
b. False
c. Both (a) & (b)
d. None of the above

Ans: - b)

6) (I).....is a machine that changes the shape of a work piece by the application of pressure.

a) Dent puller
b) Grinder
c) Press machine
d) Lathe machine

Ans: - c)

(II) Which of the following isn't forming process?

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b) Stretching
c) Bending
d) All of the above

Ans: - a)

7) (I) Plasma is a state of matter consisting of..... gas.

a) Hydrogen
b) Nitrogen
c) Carbon dioxide
d) Ionized

Ans: - d)

(II) Plasma Cutting operates at a temperature of .....°C

a) 1000°C- 1500°C
b) 10000°C- 30000°C
c) 1600°C- 2500°C
d) More than 450000°C

Ans: - b)

8) (I) .....is an example of inert gas.

a) Hydrogen
b) Oxygen
c) Helium
d) Carbon dioxide

Ans: - c)

(II) ..... is an example of active gas.

a) Helium
b) Argon

Ans: - d)

c) Neon
d) Hydrogen

9) (I) Extremely thin sheets are considered as .....

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d) None of the above

Ans: - a)

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b) Slitting
c) Perforating
d) Drawing

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b) Dent
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Ans: - b)

(II) The dent which can be removed without any damage of vehicles paints are known as.....

a) Ding
b) Extreme Dent
c) Scratch
d) Creased Dent

Ans: - a)

Direction: Attempt any six from the given questions:

Section-B **(6x5=30) Marks**

11) What are the requirement of Body Shop in an automotive workshop?

Ans: -

Automotive repair shops that specialize in bodywork repair are known as body shops. They offer paintwork repairs to scratches, scuffs and dents, as well as repairs to the bodies of vehicles damaged by traffic collisions.

Brief overview operation

- Review damage reports, prepare cost estimates, and plan work.
- Remove damaged body parts, including bumpers, fenders, hoods, grilles, and trim.
- Realign car frames and chassis to repair structural damage.
- Hammer out or patch dents, dimples, and other minor body damage.
- Fit, attach, and weld replacement parts into place.
- Install and weatherproof windows and windshields.
- Grind, sand, buff, and prime refurbished and repaired surfaces.
- Apply new finish to restored body parts.

12) Define brazing and soldering? Also write the difference between them.

Ans: -

Soldering

The joining of metals using a filler material of a lower melting point than that of the parent metals to be joined. Soldering is normally done by melting the solder with a soldering iron and applying it to the two metals that are going to be joined together.

Brazing

Brazing is when a filler metal or alloy is heated to its melting temperature above 450 °C. In this case only filler metal melts; there is no melting of work piece metal.

	Soldering	brazing
1	It is used in electrical industries to joint capacitor, resistor, wire etc. to the electronic plate.	It is used in mechanical industries to joint different metals.
2	soldering is done temperature below 200°C	Brazing is done at temperature above 450°C but below the critical temperature of metal.
3	These joint are weaker than brazing joints.	It forms stronger joints.
4	In soldering an alloy of lead and tin is used known as solder.	In brazing an alloy of copper and zinc is used as a filler metal.
5	It is a cheaper process.	It is a costly process.
6	Soldering does not need to preheat the base metal	This process need preheating of base metal.
7	It is used to join electronic components.	It is used in automotive industries and pipe fitting.
8	This process is very flexible and easy to automate.	It is not easy for automation except automation is done at automotive industries.

13) Briefly write the protective equipment used in welding along with their functions.

Ans: -

The protective equipment used in welding are:

i. King shield
ii. Gloves
iii. Nose Mask
iv. Safety goggle
v. Ear plug
vi. Apron
vii. Safety shoes

14) What are the characteristics of electrode coating?

Ans: -

The characteristics of electrode coating are:

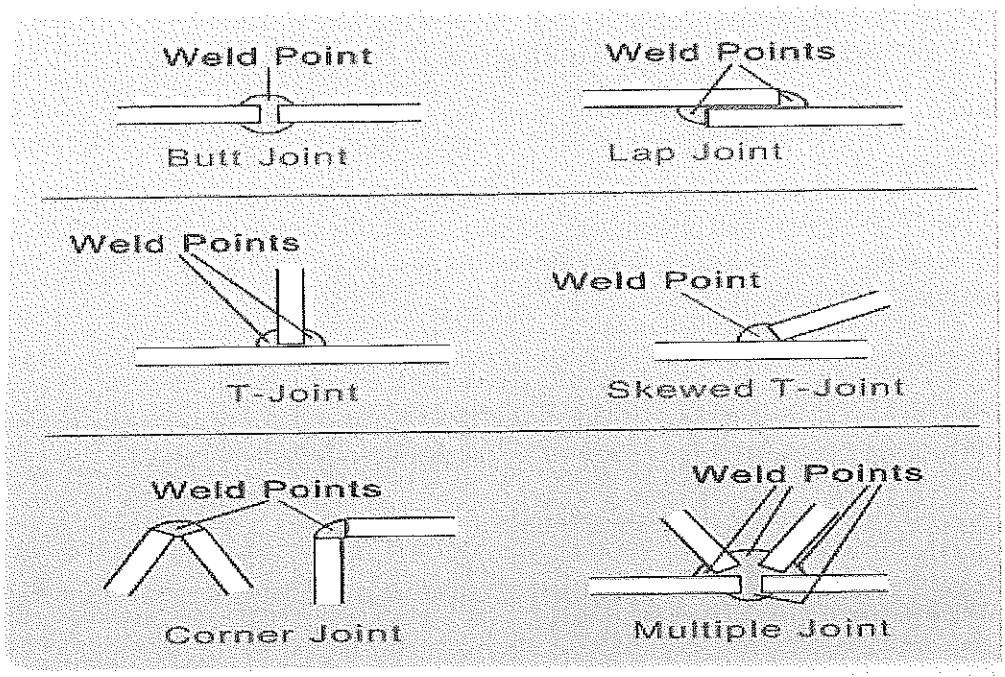
i. Provide a protective atmosphere (a gas shield around the arc).
ii. Stabilize the arc.
iii. Act as a flux to remove impurities from the molten metal.
iv. Provide a protective slag coating to accumulate impurities, prevent oxidation, and slow the cooling of the weld metal.
v. Reduce weld-metal spatter and increase the efficiency of deposition.
vi. Add alloying elements.

vii. Affect arc penetration (the depth of melting in the work piece).
viii. Influence the shape of the weld bead.
ix. Add additional filler metal.

15) List the different type of weld joints along with their diagrams.

Ans: -

The different types of weld joints are:



16) Write the different type of automotive body style with examples.

Ans: -

Buying a car can be a tiring process, especially if it's for the first time. Each person has extremely specific needs. There are several factors to consider – price, family size, fuel type, mileage. If it is a second hand purchase, one may even look at age of the car, number of owners and mileage.

Different Types of Car Body Styles are:	
Hatchback	Sedan/saloon
MUV/SUV	Coupe
Convertible/Cabriolet	Wagon

Van Jeep

Pick up vehicle Estate

17) Write short note on:

a) Ladder Chassis b) Monocoque Chassis

Ans: -

Ladder chassis

It is one of the oldest forms of automotive chassis that is still used by most of the SUVs till today. Ladder chassis resembles a shape of a ladder having two longitudinal rails inter linked by several lateral and cross braces.

Monocoque chassis

Monocoque Chassis is a one-piece structure that prescribes the overall shape of a vehicle. This type of automotive chassis is manufactured by welding floor pan and other pieces together

18) Write the process of dent removal.

Ans: -

Dent Removal Process

- Remove the paint from dented area using grinder and sand paper.
- Switch on the dent puller.
- Set the voltage and current of dent puller according to the thickness of sheets.
- Set the appropriate attachment according to the type of dent.
- Start removing dents and check in between using sensory method.
- After removing dents, grind the spots of dent puller using grinder.
- And after grinding part is ready for pre-painting

Section-C **(5x10=50) Marks**

19) Explain the weld seam inspection procedures in details.

Ans: -

Welding Inspection Process

- Destructive Testing
- Non- Destructive Testing

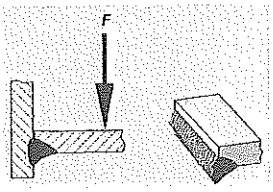
Destructive testing includes;

i. Breaking test
ii. Tension test
iii. Bend test

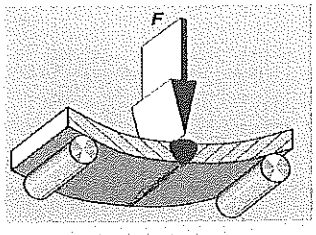
Non- Destructive Testing include;

i. Visual inspection
ii. Ultrasonic testing
iii. X-rays testing
iv. Liquid penetration

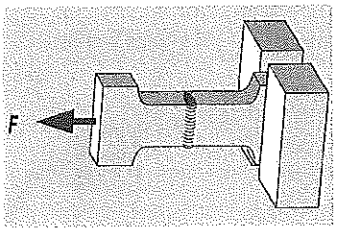
1. Fracture Test
   The weld seam is mechanically broken.



2. Bend Test
   The welded seam is bend under a press until it breaks.



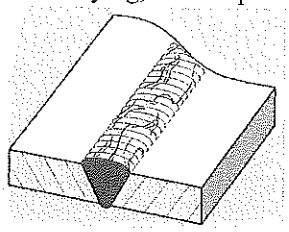
3. Tensile Test
   During the tension test, flat or round stock is stretched until it breaks.



Non- Destructive Testing

1. Visual Examination
   Use the naked eye and magnifying lens.
2. Liquid penetration
   During the liquid penetration, special red liquid is sprayed on the seam. The liquid penetrate through the capillary action, even into very thin cracks and gaps.

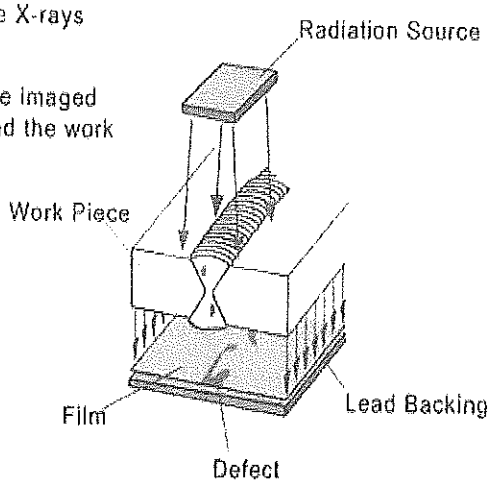
After drying, a white powder is applied which make visible to red visible



3. X-ray Inspection

During an X-ray inspection, the X-rays penetrate the weld seam.

Possible weld seam defects are imaged on a sheet of film placed behind the work piece.



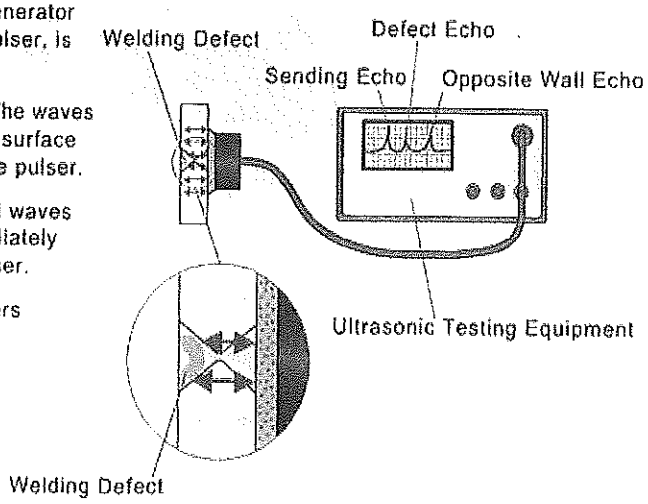
4. Ultrasonic Testing

During ultrasonic testing, a signal generator with an oil coupling, a so-called pulser, is placed on the site of the weld.

The pulser projects sound waves. The waves reflect off the opposite work piece surface and are then collected again by the pulser.

If there is a weld defect, the sound waves that strike the defect reflect immediately and return more quickly to the pulser.

The testing equipment then registers a defect echo.



20) Discuss the working principle of Resistance Spot Welding.

Ans: -

Resistance spot welding is a process in which contacting metal surfaces are joined by the heat obtained from resistance to electric current.

PRINCIPLE OF RESISTANCE WELDING

The fundamental principle on which all resistance welding is based on:

- Heat generated due to the resistance offered by the parts to the passage of heavy electric current for a fraction of a second.
- Heat produce at the junction is calculated by the formula

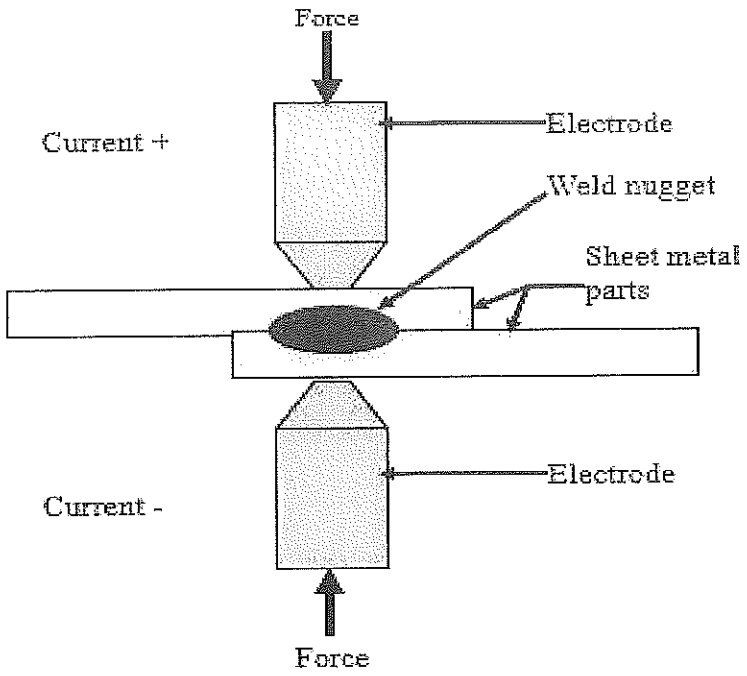
$H = I^2RT$

Where, H= Heat

I= current

R= Resistance of the conductor

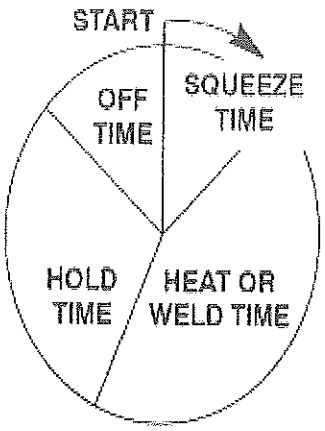
T= Time of current flow



How does it work?

- Resistant spot welding works because the copper electrodes are brilliant at conducting electricity and the electricity wants to travel through the steel to reach the other electrode.
- The steel, on the other hand wants to stop the electricity travelling through it and resists the flow.
- It's the resistance that causes the heat that melts the metal and forms what will be the 'weld nugget'.
- When the steel cools down, the melted metal will harden and form the finished weld nugget.

Welding Spot Time Cycle



Squeeze Time
Time between pressure application and weld.

Heat Or Weld Time
Weld time in cycles.

Hold Time
Time that pressure is maintained after weld is made.

Off Time
Electrodes separated to permit moving of material for next spot.

21) Explain the Gas Shielded Arc Welding and also mention its applications.

Ans: -

Gas shielded arc welding

- Gas shielded arc welding is also performed with the help of a welding arc.
- During welding, the molten pool is protected by a gaseous shield.
- The shield is not produced by the electrode covering.
- Here, the shielding gas comes directly from a gas cylinder and is fed through a gas nozzle on the torch to the welding point.
- Can be used from a wall thickness of approx. 0.6 mm
- High melting deposition rate
- Targeted heat input
- No or very little slagging
- Very little warping

- (virtually) continuous welding without changing the electrode

MIG welding

- Metal inert gas welding takes its name from the use of inert gases such as argon, helium and mixture of the two gases.
- MIG welding is an arc welding process in which a continuous solid wire electrode is fed through a welding gun and into the weld pool, joining two base material together
- The process is semi- automatic because the electrode and gas are automatically fed through a welding the gun at a user defined speed when the operator pulls down the trigger.

MAG welding

- Metal active gas welding takes its name from the active welding gas used (CO_2 or gas mixture (argon containing active gas, two or three components)).
- Long and short arc are used during MAG welding.
- MAG welding is a steel welding process.

Application

It is used in mass production in industries, automotive body repair shops, etc.

22) Describe the principle of plasma cutting process.

Ans: -

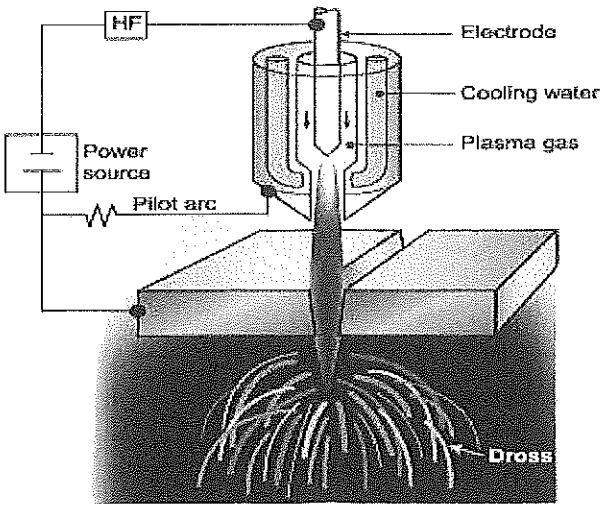
Principle of operation

Plasma arc cutting is a process resulting from ionizing a column of gas (argon, nitrogen, helium, air, hydrogen or their mixture) with extreme heat of an electric arc.

The ionized gas along with the arc is forced through a very small nozzle orifice, resulting into a plasma stream of high velocity (up to 600 m/sec) and high temperature (up to 20000 k).

When this high speed is reached, high temperature plasma stream and electric arc strike the workpiece, and ion in the plasma recombine into gas atoms and liberate a great amount of latent heat.

This heat melts the workpiece, vaporizes part of the material and the balance is blasted away in the form of molten metal through the heat.



23) Describe the different type of sheet metal processes.

Ans: -

Sheet metal processing

Typically, sheets of metal are sold as flat, rectangular sheets of standard size. If the sheets are thin and very long, they may be in the form of rolls. Therefore the first step in any sheet metal process is to cut the correct shape and sized 'blank' from larger sheet.

Sheet metal forming processes

Sheet metal processes can be broken down into two major classifications and one minor classification

- **Shearing processes** -- processes which apply shearing forces to cut, fracture, or separate the material.
- **Forming processes** -- processes which cause the metal to undergo desired shape changes without failure, excessive thinning, or cracking. This includes bending and stretching.
- **Finishing processes** -- processes which are used to improve the final surface characteristics.

Shearing Process

- **Punching:** shearing process using a die and punch where the **interior** portion of the sheared sheet is to be **discarded.**
- **Blanking:** shearing process using a die and punch where the **exterior** portion of the shearing operation is to be **discarded**.
- **Perforating**: punching a number of holes in a sheet
- **Parting:** shearing the sheet into two or more pieces
- **Notching:** removing pieces from the edges
- **Lancing:** leaving a tab without removing any material

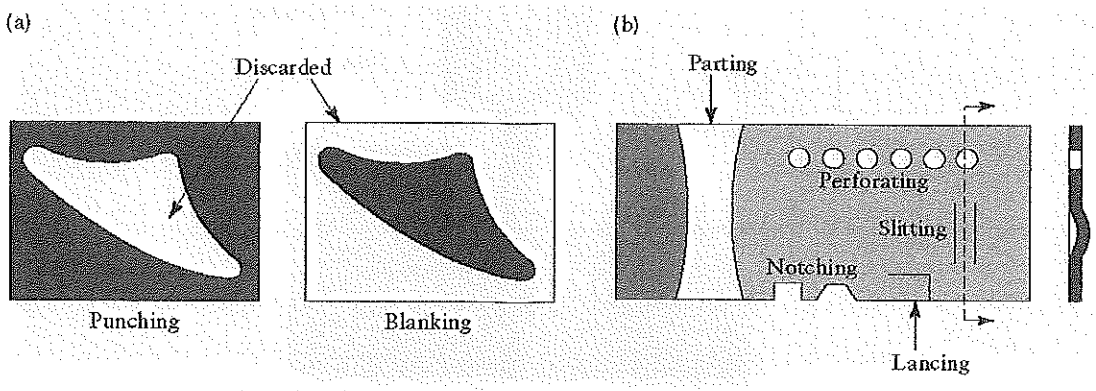


Fig.1 Shearing Operations: Punching, Blanking and Perforating

Forming Processes

- **Bending:** forming process causes the sheet metal to undergo the desired shape change by bending without failure.
- **Stretching:** forming process causes the sheet metal to undergo the desired shape change by stretching without failure.
- **Drawing:** forming process causes the sheet metal to undergo the desired shape change by drawing without failure.
- **Roll forming:** Roll forming is a process by which a metal strip is progressively bent as it passes through a series of forming rolls.

Registration No: .....

SCHOOL OF AUTOMOTIVE SKILLS

FIRST END-SEMESTER EXAMINATION – 2018

WINTER SEMESTER, B. VOC. PROGRAM

Course Code: AUT1004 Time: 3 Hour

Course Name: AUTOMOTIVE SPRAY PAINTING

Max. Marks: 100

Instructions: (1) Attempt all questions from section A and section C.

(2) Attempt any six questions from section B

Section-A

Select the one correct option from the given options in the following questions :- 10x2=20 Marks

Q-1 (i) What should be the distance between HVLP spray gun and panel during painting?

a. 6-8 inches
c. 12-15 inches
b. 1-3 inches
d. None of these

(ii) The Angle of spray gun during painting should be...

a. 90°
c. 45°
b. 120°
d. None of these

Q-2 (i). Which grit size is the most coarse among the following grit sizes?

a. P180
c. P80
b. P600
d. P320

(ii). The equipment used to remove the extra putty from the surface is...

a. Putty Spreader Sheet
c. Spray gun
b. Dry Sander
d. Plier

Q-3 (i). The air pressure of the HVLP spray gun should be....

a. 2-3 bar
c. 5-6 bar
b. 4-5 bar
d. None of these

(ii). The ventilation of the paint mixing room must be...

a. Downwards
c. Sideways
b. Upwards
d. None of thes

Q-4(i). The paint mixing room should be equipped with.... .....

a. Blue lights
c. Artificial lights
b. Yellow lights
d. None of these

(ii). Infrared dryer works on the principle of...

a. Conduction
c. Radiation
b. Convection
d. None of these

Q-5(i). Which one of the following automotive paintings is also known as 3-stage painting?

a. Solid painting
c. Metallic painting
b. Pearlscent painting
d. None of these

(ii). The shape of the spray should be...,.....in shape.

a. Circular
c. Triangular
b. Oval
d. None of these

Q-6 (i). The clear coat is used for....

a. Protection of paint
c. Both (a) and (b)
b. Gloss of paint
d. None of these

(ii). The paint defect occurred due to wrong sanding is...

a. Sanding scratches
c. Water spotting
b. Orange peel
d. None of these

Q-7 (i). The size of nozzle tip for primer application is.... .....

a. 1.8 mm
c. 1.3 mm
b. 0.8 mm
d. None of these

(ii). The size of nozzle tip for clear coat application is...

a. 1.8 mm
c. 1.2 mm
b. 0.8 mm
d. None of these

Q-8 (i) The liquid used to make the paint smooth for spraying is ...

a. Thinner
c. water
b. Hardener
d. None of these

(ii). Which one of the following elements of paint provides the paint its colour?

a. Binder
c. Solvent
b. Pigment
d. None of these

Q-9 (i) primer is used to....

a. Protect the metal from rust
b. Hide the putty
c. Support the topcoat
d. None of these

(ii) Which one of the sanding processes promotes the corrosion?

a. Wet sanding
b. Dry sanding
c. Both (a) and (b)
d. None of these

Q-10 (i). Which one of the following elements enhances the properties of paint ?

a. Additives
b. Binders
c. Solvents
d. None of these

(ii). DFT (Dry film thickness) is an instrument which is used to measure...

a. Thickness of coating
b. Colour quantity
c. Gloss of paint
d. None of these

Section-B

6x5=30 Marks

Q-11 Define paint. What are the different elements of paints?

Q-12. Write different properties of primer.

Q-13. Write roles and responsibilities of a paint shop technician?

Q-14 What are the five consumables used in paint shop?

Q-15 Write any five equipment used in paint shop.

Q-16 What is Infrared drying? What are the advantages of infrared drying?

Q-17 Write the steps for painting using solid paint?

Q-18 What is the use of dry guide coat during dry sanding?

Section-C

5x10=50 Marks

Q-19. What is paint defect? Write different types of paint defects and explain any four with its causes, preventions and remedies.

Q-20.What is a spray gun? Explain different types of spray guns with their applications.

Q-21.What is a primer? Explain different types of primers.

Q-22. What is masking? Explain different materials used for masking.

Q-23. Discuss paint booth and paint mixing room.

ANSWER SHEET

Registration No: .....

SCHOOL OF AUTOMOTIVE SKILLS
FIRST END-SEMESTER EXAMINATION – 2018
SUMMER SEMESTER, B. VOC. PROGRAM

Course Code: AUT1004 **Time: 3 Hour**

Course Name: AUTOMOTIVE SPRAY PAINTING

Max. Marks: 100

Instructions: (1) Attempt all questions from section A and section C.

(2) Attempt any six questions from section B

Section-A

Direction : Select the one correct option from the given options in the following questions :-

20x1=20 Marks

Q-1 (i) What should be the distance between HVLP spray gun and panel during painting?

a. 6-8 inches
c. 12-15 inches
b. 1-3 inches
d. None of these

Answer- a

(ii) The Angle of spray gun during painting should be...

a. 90°
c. 45°
b. 120°
d. None of these

Answer- a

Q-2 (i). Which grit size is the coarsest among the following grit sizes?

a. P180
c. P80
b. P600
d. P320

Answer- c

(ii). The equipment used to remove the extra putty from the surface is...

a. Putty Spreader Sheet
c. Spray gun
b. Dry Sander
d. Plier

Answer- b

Q-3 (i). The air pressure of the HVLP spray gun should be....

a. 2-3 bar
c. 5-6 bar
b. 4-5 bar
d. None of these

Answer- a

(ii). The ventilation of the paint mixing room must be...

a. Downwards
b. Upwards
c. Sideways
d. None of these

Answer- a

Q-4(i). The paint mixing room should be equipped with.... .....

a. Blue lights
b. Yellow lights
c. Artificial lights
d. None of these

Answer- c

(ii). Infrared dryer works on the principle of...

a. Conduction
b. Convection
c. Radiation
d. None of these

Answer- c

Q-5(i). Which automotive painting is also known as 3-stage painting...

a. Solid painting
b. Pearlscent painting
c. Metallic painting
d. None of these

Answer- b

(ii). The shape of the spray should be...,.....in shape.

a. Circular
b. Oval
c. Triangular
d. None of these

Answer- b

Q-6 (i). The clear coat is used for....

a. Protection of paint
b. Gloss of paint
c. Both (a) and (b)
d. None of these

Answer- c

(ii). The paint defect occurred due to wrong sanding is...

a. Sanding scratches
b. Orange peel
c. Water spotting
d. None of these

Answer- a

Q-7 (i). The size of nozzle tip for primer application is.... .....

a. 1.8 mm
b. 0.8 mm
c. 1.3 mm
d. None of these

Answer- a

(ii). The size of nozzle tip for clear coat application is...

a. 1.8 mm
c. 1.2 mm
b. 0.8 mm
d. None of these

Answer- c

Q-8 (i) The liquid used to make the paint smooth for spraying is ...

a. Thinner
c. water
b. Hardener
d. None of these

Answer- a

(ii). Which element of paint provides the paint its colour?

a. Binder
c. Solvent
b. Pigment
d. None of these

Answer- b

Q-9 (i) primer is used to....

a. Protect the metal from rust
c. Support the topcoat
b. Hide the putty
d. None of these

Answer- a

(ii) Which sanding promotes the corrosion?

a. Wet sanding
c. Both (a) and (b)
b. Dry sanding
d. None of these

Answer- a

Q-10 (i). The elements which enhance the properties of paint are....

a. Additives
c. Solvents
b. Binders
d. None of these

Answer- a

(ii). DFT (Dry film thickness) is an instrument which is used to measure...

a. Thickness of coating
c. Gloss of paint
b. Colour quantity
d. None of these

Answer- a

Section-B

Instructions: Attempt any six questions **6x5=30 Marks**

Q-11 What is paint? What are the different elements of paints?

Ans. Paint is a mixture of different chemicals which gives aesthetic appearance, provides strength, prevent from atmospheric conditions.

Paint is made up of five basic elements: -

1. Binder/Resin
2. Pigment
3. Additives
4. Hardener
5. Solvent

- **Binder:-**

1. It provides paint its gloss.
2. It also provides hardness, durability and adhesion.
3. It also wets the pigment from a powder to a liquid.

- **Pigment:-**

1. These are small particles of powder that are insoluble in water or organic solvents.

2. They are added to give the coating colour and good hiding power.

3. The most commonly used pigments are yellow and red iron oxides.

- **Additives:-**

1. It improves the paint film properties.
2. It is also used to eliminate the flaws and defects which effects the finish of the car.
3. There are different types of additives like flexible agents, fish-eye additives , drying additives , flattening additives etc.

- **Hardener:-**

1. It is used to initiate and complete the drying process.

2. It also speed up the drying process

- **Solvent:-**

1. It reduces the viscosity.
2. It dissolves the binder and pigment to a liquid state.
3. There are different types of additives like flexible agents , fish-eye additives , drying additives , flattening additives etc

Q-12.Write about different properties of primer.

Ans
- **Adhesion** – they provide a strong bond between the sheet metal or old paint and the new paint
- **Rust resistance** – they resist the formation of rust where they adhere to the sheet metal
- **Build**– they're able to fill sanding and grinding marks in old paint, sheet metal and fillers
- **Sanding ease** – they can be sanded smooth and levelled quickly and easily
- **Hold out** – they prevent the paint from soaking in, which results in a dull finish
- **Drying speed** – a good high-build primer should be ready to sand in as little as 30 minutes

Q-13.Write about jobs and responsibilities of a paint shop technician.

Ans The various jobs and responsibilities of paint shop technicians are:_

a. To carry all types of vehicle body refinishing work like:-

1. Pre -paint preparation
2. Priming and painting
3. Paint inspection
4. Rectification of defects

a. To identify and utilise the correct methods of working by using your experience, skills, training and industry knowledge,

b. To keep your skills up-to-date by making appropriate efforts to acquire adequate knowledge of new vehicles.

a. To identify and report all apparent faults considered to be advisable in the interest of safety and reliability

Q-14 Write about five consumables used in paint shop?

Ans List of consumables used in paint shop: -

1. Sanding discs
2. Putty
3. Dry guide coat
4. Primer
5. Tack cloths

Q-15 Write about any five equipments used in paint shop.

Ans. The five equipment used in paint shop are:-

1. Dual Action sander
2. Paint Booth
3. Infrared dryer
4. Single action sander
5. Paint mixing rack

Q-16 What is Infrared drying? What are the advantages of infrared drying?

Ans **Infrared drying:-**

- It involves a heat transfer by radiation between a hot element and a material at lower temperature.
- The heat energy is directly transferred from the infrared source without the need of an intermediate such as air or water.

Advantages:-

- No direct contact with the product to be heated.
- High drying rate.
- Infrared radiation can be focused where it is needed

Q-17 Write the steps for painting using solid paint?

Ans steps for solid painting:-

a. Inspection of defected area
b. Clean with prepsol degreaser (3919S)
c. Clean with soap and water (Dry)

Application process: Wipe on and Wipe off Method.

D. Sanding: P-80, P180, P320(Feather Edging)
E. Putty Application: (759/769 R Polyester putty: 762R Hardener = 100: 1-3% by weight.
E. Apply Guide coat
F. Putty dry sanding (P80, P180, P320) (120, 220, 320)
G. Blow air/ degreaser with 3920S
Process: wipe on wipe off.
H. Primer Surface application: (7701S/4004 fast process)
I. Apply dry guide coat.
J. Dry sanding with P320/ 400
K. Clean with air & degreaser 3920S.
L. Top Coat application.

Q-18 Why we use dry guide coat during dry sanding?

Ans. Dry guide coat is a black powder which is used to find the imperfection during putty and primer dry sanding. It guides the sander during the sanding that from which part we have to remove the material.

Section-C

5x10=50 Marks

Q-19. What is paint defect? Write about different paint defects and explain any four with its causes, preventions and remedies.

Ans:- **Paint defect**- Any dissimilarity between the original paint and refinish paint work is considered to be a paint defect.

There are lot of paint defects like:-

1.runs

2.water spotting

3.clouding

4.bird droppings

5.solvent popping

Brief description of defects:-

1.Runs

Causes:-

- Incorrect spraying viscosity, spraying technique.
- Defective spray gun set up .
- Incorrect spraying pressure .
- Temperature of paint, substrate or spray booth too low.
  Incorrect choice of hardeners and thinners

Prevention:-

- Ensure that the spray gun is in good working order.
- Warm object and material up to room temperature of 20 °C/68 °F.
- Use correct combination of hardeners and thinners .
-

Remedies:-

- Sand and polish.
- Sand and repaint

2. **water spotting**

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

3.**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.

4. **sanding scratches**

Causes:-

- Sanding paper too coarse.
- Filler sanded when soft.
- Insufficient sanded polyester stopper.
- Insufficient isolation of the stopper before topcoat application

Prevention:-

- Use recommended grade sanding paper.
- Isolate repaired areas with 2K filler.
- Dry filler thoroughly.

Remedies:-

- Thoroughly dry and sand.
- Isolate or remove substrate, repaint

Q-20. What is a spray gun? Explain different types of spray guns with their applications.

Ans. The spray gun is the most popular type of spray application equipment used

- An spray gun is a tool which uses compressed air to atomise paint and to apply it to a surface.
- Air and material enter the gun through separate passages and are mixed at the air cap in a controlled pattern.

Different types of spray guns are:-

1. **Cup spray guns**

- Cup sprayers are airless powered spray guns useful primarily for crafts and hobbies.
- They provide a quick and even paint surface, and are very convenient to use.
- A small electric pump forces paint is through the gun ad onto the surface.

2. **Air spray guns**

- Air spray guns use compressed air to spray paint onto a surface.
- To use an air spray gun, always mask the surrounding area and spray from a distance of 6 to 12 inches.
- These guns are ideal for high quality jobs, such as automotive work

3. **Airless spray guns**

- They are suitable for large exterior and interior paint jobs.
- They operate under high pressure and work with a variety of paint types.
- Users should mask the surrounding area and should paint from a distance of 12 inches.

4. **HVLP spray guns**

- HVLP stands for high-volume, low-pressure.
- These guns use high volume of air to push the paint through the nozzle.
- Dilute the paint to make it thinner, and spray from a distance of six to eight inches.

Q-21.What is primer? Explain different types of primers.

Ans

- . Primers are the most common undercoats used when refinishing car bodies.
- Primer is a bonding agent which enables a bond between the surface underneath it and the paint that will be sprayed on top.

Basically primers are categorised in 2 parts:-

1. 1-k primers
2. 2-k primers

Types of primers:-

1. **Epoxy primer:-**

- Epoxy Primer is one of the most versatile primers available as its compatible with most any other coating.
- It's acceptable for use over bare metal .
- Surfaces coated with epoxy primer can also have plastic body filler applied over it if properly prepared.
- Sanding the metal with 80-120 grit sandpaper before epoxy Primer.

2. **Self Etching Primer:-**

- This primer is most commonly a lacquer based primer that uses acid to etch bare, clean metal.
- It leaves a good base for urethane primers and top coats and is ideal for small spot repairs.
- When applied over properly prepared metal it has extremely good adhesion qualities.
- Do not apply body filler over top of self-etching primer as it may cause separation of the filler over time.
- Sanding the metal with 80-120 grit sandpaper before applying Self-Etching Primer.

3. **Urethane Primer Surfacer**

- Urethane Primer is the next coating you should use after epoxy or self-etching primer and filler.
- This is used where you will really want the bodywork to become nice and flat.
- We suggest finishing the surface with 180-220 grit sandpaper before applying urethane primer.

Sprayable Polyester Primer:-

- It builds extremely well, fills minor imperfections in your bodywork, and can be block sanded flat like your body fillers.
- This can be applied over your epoxy or self-etching primer and body filler.

This is used as your final step in the "bodywork" stage to get your panels laser-straight

Q-22. What is masking? Explain different materials used for masking.

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

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

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

- **Masking Paper**

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

- **Plastic sheet masking**

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

- **Masking tapes**

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

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

- **Plugs and caps**

1. The use of plugs for masking or covering of nuts and both plain and threaded holes.

Generally are made of silicone because of its high resistance to solvents, temperature and handling

- **Masking rope**

1. Masking rope are self-adhesive foam strips used in holes and openings.
2. This type of masking material is used on the edges of the doors, hinged covers

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

Q-23. Discuss about paint booth and paint mixing room.

Ans:- **Paint mixing room**

- Paint mixing room is a place where we mix the the paints according to the requirements.
- It should have colour-corrected artificial lighting and downdraft ventilation.
- Paint mix rooms are generally located next to the spray booth to maximise painter productivity

Benefits of mixing room:-

- **Waste reduction:-** You mix only the amount of paint you need.
- **Time savings:-** Your paint is ready when you need it.
- **Versatility:-** You can match thousands of factory colours

PAINT BOOTH

- Paint booths are walled structures used to safely contain painting and other finishing processes.
- Paint booths are present in a variety of industries including automotive, aviation, manufacturing, millworks, and many more.

In general there are two types of paint booths:

- Non-ducted (open face)
- Directly ducted (enclosed)

REASON TO USE PAINT BOOTH

- Confine the application of a hazardous material to a restricted controlled environment
- Prevent hazardous overspray and volatiles from escaping confinement and causing fire or explosion to nearby operations.
- Control air fuel/mixture so that a combustible combination cannot occur.
- Provide a clean environment in which to paint

Registration No:.....

BSDU

SCHOOL OF AUTOMOTIVE SKILLS

FIRST SEMESTER, END-SEMESTER EXAMINATION

WINTER SEMESTER, B. VOC. PROGRAM, 2017-18

Course Code: AUT1005 **Time: 3 Hour**

Course Name: AUTOMOTIVE ELECTRICAL FUNDAMENTALS AND A.C **Max. Marks: 100**

Instructions: (1) Attempt all question from section A & section C.

(2) Attempt any six questions from section B.

Section-A **(10x2) = 20 Marks**

Select the one correct option from the given options in the following questions :-

Q1. (I) The centrifugal compressor is generally used for refrigeration that requires:

(A) small displacements and low condensing pressures

(B) large displacements and high condensing pressures

(C) small displacements and high condensing pressures

(D) large displacements and low condensing pressures

(II) The pressure at the outlet of a refrigerant compressor is called:

(A) suction pressure (B) discharge pressure

(C) critical pressure (D) back pressure

Q2. (I) Compressor in a refrigeration system increases:

(A) pressure (B) temperature

(C) both (D) None of these

(II) A refrigerant compressor is used to:

(A) raise the pressure of the refrigerant (B) raise the temperature of the refrigerant

(C) circulate the refrigerant through the refrigerating system (D) all of above

Q3. (I) The pressure in a capillary tube is decreased due to:

(A) frictional resistance offered by the tube wall (B) acceleration of refrigerant in the tube

(C) heat transfer from the tube (D) both a and b

(II) The refrigerant supplied to a compressor must be:

(A) superheated vapour (B) dry saturated liquid

(C) a mixture of liquid and vapour (D) none of the above

Q4. (I) In which part, the cooling is achieved in the refrigerator:

(A) compressor (B) condenser

(C) evaporator (D) capillary

(II) The pressure at the inlet of refrigerant compressor is called:

(A) suction Pressure (B) discharge Pressure

(C) critical pressure (D) back pressure

Q5. (I) Evaporator in a refrigeration plant is fitted:

(A) before the condenser (B) after the condenser

(C) after the compressor (D) none

(II) The reciprocating refrigerant compressor are very suitable for:

(A) small displacement and low condensing pressure

(B) large displacement and high condensing pressure

(C) small displacement and high condensing pressure

(D) large displacement and low condensing pressure

Q6 (I) Condenser in refrigeration system is used to:

(A) decrease pressure (B) increase pressure

(C) heat transfer (D) none of these

(II) Under which one of the categories Scroll compressor falls:

(A) positive displacement (B) roto-dynamic type

(C) none (D) both

Q7. (I) In vapour Compression refrigeration system, heat is rejected by the refrigerant in:

(A) compressor (B) condenser

(C) throttle valve (D) evaporator

(II) One Ton refrigeration is equivalent to:

(A) 1 kW (B) 2.5 kW

(C) 3.5 kW (D) 5 kW

Q8. (I) Knock sensor is used for which one of the following:

(A) monitors engine speed (B) monitors the position of valves in engine

(C) detects engine knocking (D) measures the speed of a vehicle

(II) Air–Fuel Ratio Meter is used for which one of the following:

(A) monitors the correct air-fuel ratio (B) monitors engine speed

(C) monitors Carbon Monoxide & Air ratio (D) monitors Nitrogen and Fuel ratio

Q9. (I) Which one of the following is used for camshaft speed and position sensing:

(A) variable reluctance sensor (B) variable resistance sensor

(C) variable capacitance sensor (D) variable current sensor

(II) Thermocouples are used to measure:

(A) pressure (B) temperature

(C) humidity (D) resistance

Q10. (I) Acceleration sensor is an integral part of:

(A) ABS (B) air Bag system

(C) all of the above (D) none of the above

(II) A signal conditioning circuit uses:

(A) schmitt Trigger (B) quenched Oscillator

(C) all of the above (D) none of the above.

Section-B (6x5) = 30 Marks

Q11. Write the name of different types of refrigerants.

Q12. Explain with a neat sketch vapor compression refrigeration cycle mention the functions of each component involved in it.

Q13. Explain with a neat sketch the working of the electronic expansion valve.

Q14. Explain with a neat sketch the working of shell and tube type condenser.

Q15. What is Yaw? Give description and technical data of Yaw Rate Sensor.

Q16. With the help of a neat diagram explain the working principle of Mass Air Flow Sensor.

Q17 What are thermocouples and where they are used in automobiles?

Q18. What are actuators? Give at least three examples of actuators.

Section-C (5x10) = 50 Marks

Q19. Differentiate between heat engine, heat pump and refrigeration with help of neat sketches.

Q20. Explain the followings with neat sketches:

(a) Rotary compressor.

(b) Steps involved in AC Servicing

Q21. Explain with a neat sketch ODP and GWP What are main causes of Ozone depletion and Global warming?

Q22. What are Thermistors? Discuss important factors responsible for accurate measurement mention their applications in automobiles.

Q23. Explain principle and construction of Lambda Sensor in detail. What is meant by Lambda value of one?

Registration No:.....

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SCHOOL OF AUTOMOTIVE SKILLS

FIRST SEMESTER, END-SEMESTER EXAMINATION – 2017-18

WINTER SEMESTER, B. VOC. PROGRAM

Course Code: AUT1005 Time: 3 Hour

Course Name: AUTOMOTIVE ELECTRICAL FUNDAMENTALS AND A.C Max. Marks: 100

Instructions: (1) Attempt all question from section A & section C.

(2) Attempt any six questions from section B.

Section-A

Select the one correct option from the given options in the following questions :- (10x2) = 20 Marks

Q1. (I) The centrifugal compressor is generally used for refrigeration that require:

(A) small displacements and low condensing pressures

(B) large displacements and high condensing pressures

(C) small displacements and high condensing pressures

(D) large displacements and low condensing pressures

Ans: (D)

(II) The pressure at the outlet of a refrigerant compressor is called:

(A) suction pressure (B) discharge pressure

(C) critical pressure (D) back pressure

Ans: (B)

Q2. (I) Compressor in a refrigeration system increases:

(A) pressure (B) temperature

(C) both (D) None of these

Ans: (C)

(II) A refrigerant compressor is used to:

(A) raise the pressure of the refrigerant (B) raise the temperature of the refrigerant

(C) circulate the refrigerant through the refrigerating system (D) all of above

Ans: (D)

Q3. (I) The pressure in a capillary tube is decreased due to:

(A) frictional resistance offered by the tube wall (B) acceleration of refrigerant in the tube

(C) heat transfer from the tube (D) both a and b

Ans: (D)

(II) The refrigerant supplied to a compressor must be:

(A) superheated vapour (B) dry saturated liquid

(C) a mixture of liquid and vapour (D) none of the above

Ans: (A)

Q4. (I) In which part, the cooling is achieved in the refrigerator:

(A) compressor (B) condenser

(C) evaporator (D) capillary

Ans: (C)

(II) The pressure at the inlet of refrigerant compressor is called:

(A) suction Pressure (B) discharge Pressure

(C) critical pressure (D) back pressure

Ans: (A)

Q5. (I) Evaporator used in home freezer is:

(A) plate evaporator (B) shell and tube evaporator

(C) finned evaporator (D) shell and coil evaporator

Ans: (A)

(II) The reciprocating refrigerant compressor are very suitable for:

(A) small displacement and low condensing pressure

(B) large displacement and high condensing pressure

(C) small displacement and high condensing pressure

(D) large displacement and low condensing pressure

Ans: (C)

Q6 (I) Condenser in refrigeration system is used to:

(A) decrease pressure (B) increase pressure

(C) heat transfer (D) none of these

Ans: (C)

(II) Scroll compressor falls under which category:

(A) positive displacement (B) roto-dynamic type

(C) none (D) both

Ans: (A)

Q7. (I) In vapour Compression refrigeration system, heat is rejected by the refrigerant in:

(A) compressor (B) condenser

(C) throttle valve (D) evaporator

Ans: (B)

(II) One Ton refrigeration is equivalent to:

(A) 1 kW (B) 2.5 kW

(C) 3.5 kW (D) 5 kW

Ans: (C)

Q8. (I) Knock sensor is used for which one of the following:

(A) Monitors engine speed (B) Monitors position of valves in engine

(C) Detects engine knocking (D) Measures the speed of a vehicle

Ans: (C)

(II) Air–fuel Ratio Meter is used for which one of the following:

(A) Monitors the correct air–fuel ratio
(B) Monitors engine speed
(C) Monitors Carbon Monoxide & Air ratio
(D) Monitors Nitrogen and Fuel ratio

Ans: (A)

Q9. (I) Which one on the following is used for cam shaft speed and position sensing:

(A) Variable reluctance sensor
(B) Variable resistance sensor
(C) Variable capacitance sensor
(D) Variable current sensor

Ans: (A)

(II) Thermocouples are used to measure:

(A) Pressure
(B) Temperature
(C) Humidity
(D) Resistance

Ans: (B)

Q10. (I) Acceleration sensor is an integral part of

(A) ABS
(B) Air Bag system
(C) All of the above
(D) None of the above

Ans: (C)

(II) A signal conditioning circuit uses

(A) Schmitt Trigger
(B) Quenched Oscillator
(C) All of the above
(D) None of the above.

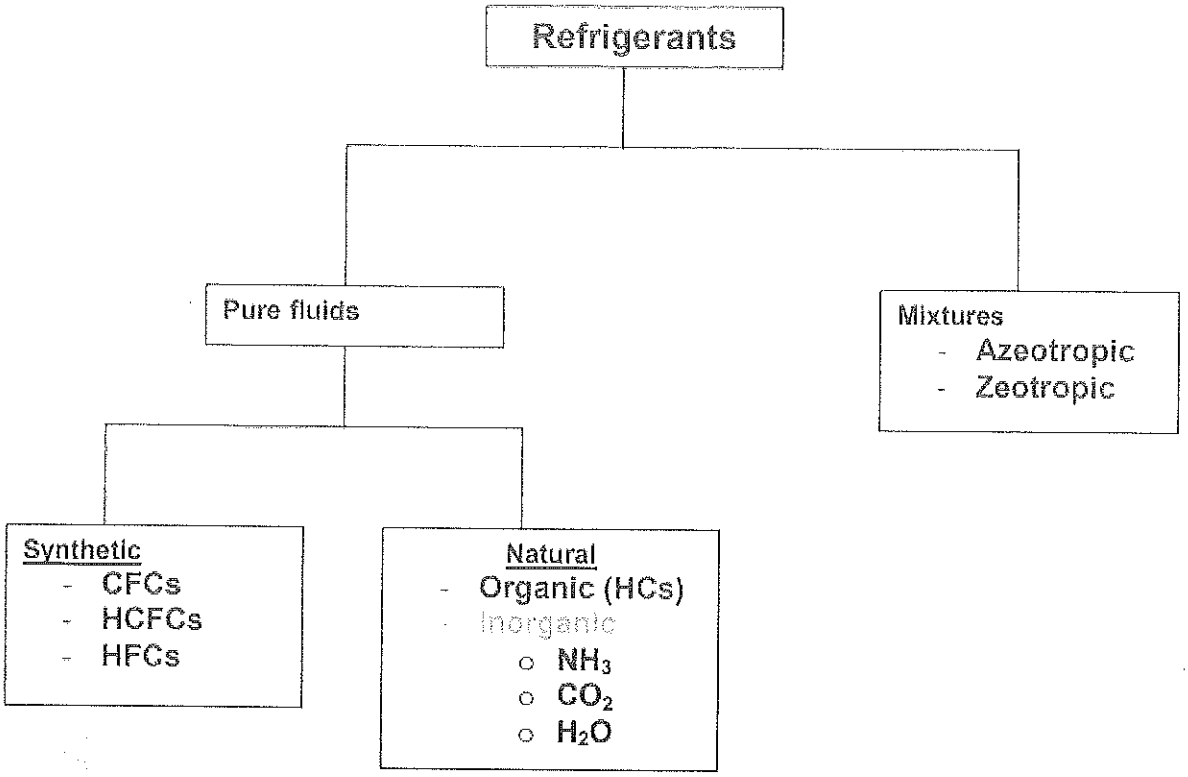
Ans: (C)

Section-B

(6x5) = 30 Marks

Q11. Write the names of different types of refrigerants.

Ans:11



Mixtures: Azeotropic mixtures are designated by 500 series, where as zeotropic refrigerants (e.g. non-azeotropic mixtures) are designated by 400 series.

Azeotropic mixtures:

R 500: Mixture of R 12 (73.8 %) and R 152a (26.2%)

R 502: Mixture of R 22 (48.8 %) and R 115 (51.2%)

R503: Mixture of R 23 (40.1 %) and R 13 (59.9%)

R507A: Mixture of R 125 (50%) and R 143a (50%)

Zeotropic mixtures:

R404A : Mixture of R 125 (44%), R 143a (52%) and R 134a (4%)

R407A : Mixture of R 32 (20%), R 125 (40%) and R 134a (40%)

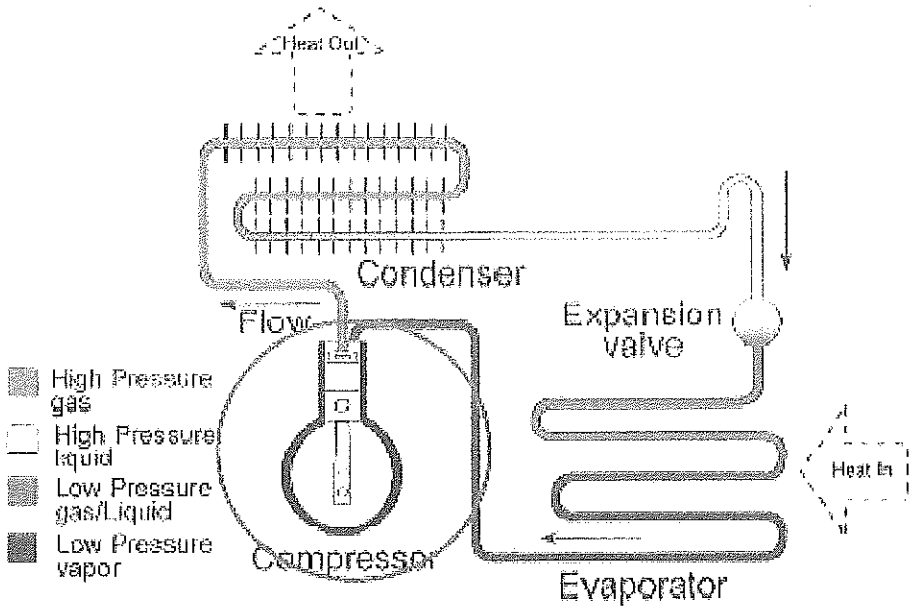
R407B : Mixture of R 32 (10%), R 125 (70%) and R 134a (20%)

R410A : Mixture of R 32 (50%) and R 125 (50%)

Q12. Explain with neat sketch vapor compression refrigeration cycle also write down functions of components involved in it.

Ans: 12

Compressors



Compressor function: to compress the refrigerant

Condenser function: To remove heat from condenser

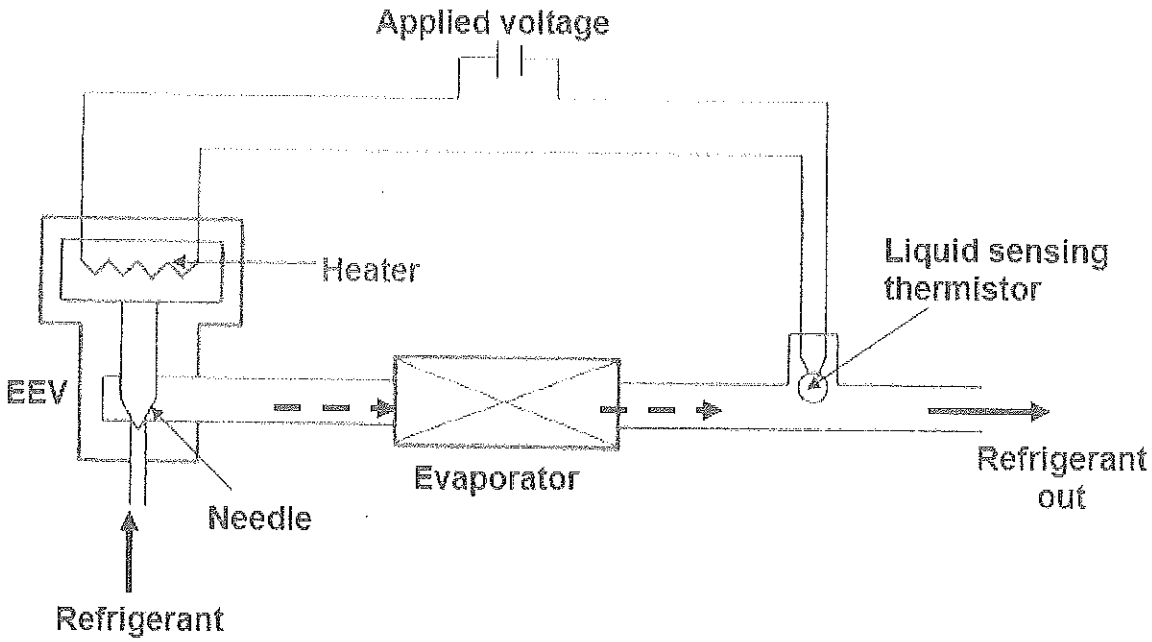
Expansion valve function: To decrease the pressure

Evaporator function: To extract heat from room

Q13. Explain with a net sketch the working of the electronic expansion valve.

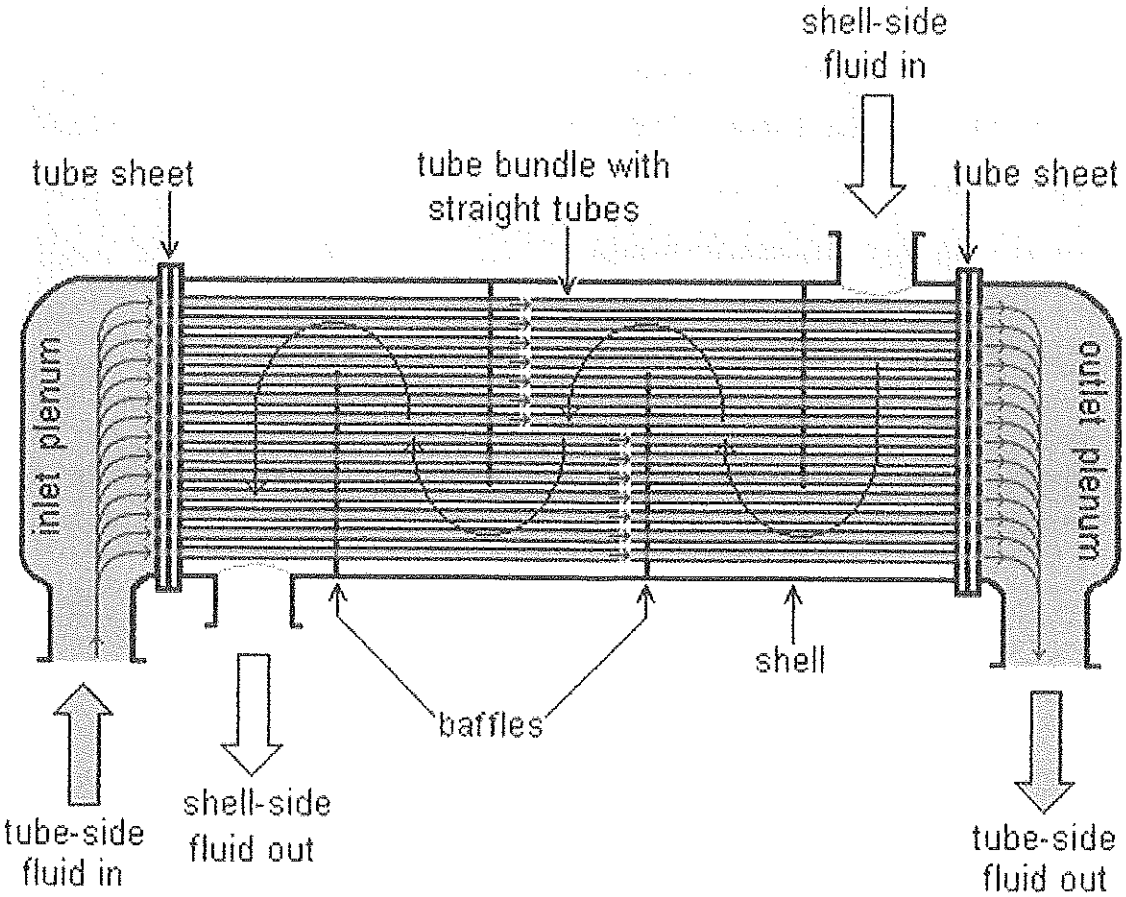
Ans:

- ✓ An electronic expansion valve consists of an orifice and a needle in front it.
- ✓ The needle moves up and down in response to magnitude of current in the heating element.



Q14. Explain with neat sketch the working of shell and tube type condenser.

Ans:



- It is essential for the designer to have a good working knowledge of the mechanical features of STHEs and how they influence thermal design.
- The principal components of an STHE are:
- shell; shell cover;
- tubes; tubesheet;
- baffles; and nozzles.
- Other components include tie-rods and spacers, pass partition plates, impingement plate, longitudinal baffle, sealing strips, supports, and foundation.

Two fluids can exchange heat, one fluid flows over the outside of the tubes while the second fluid flows through the tubes. The fluids can be single or two phase and can flow in a parallel or a cross/counter flow arrangement.

Q15. What is Yaw? Give description and technical data of Yaw Rate Sensor.

Ans: A yaw is a movement around the vertical axis of a rigid body that changes the direction it is pointing, to the left or right of its direction of motion. Description and technical data of Yaw rate senor is given below:

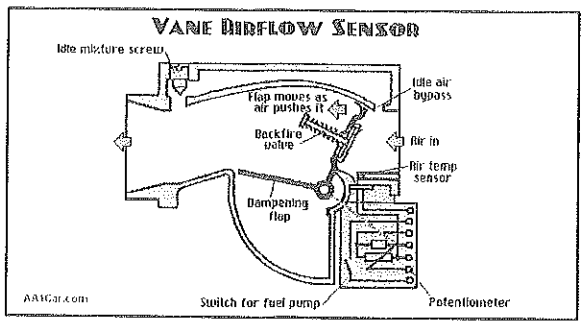
The application of Yaw Rate sensor is in ESP (Electronic Stability Program) of a vehicle. It is generally installed in the passenger compartment. Sensing principle is based on Micromechanics using CAN (Controller Area Network) interface.

Technical Data:

- Yaw Rate sensor measuring range: $\pm 100^{0}$ / sec.
- Acceleration sensor measuring range: $\pm 1.8g$
- Initialization time: <=1.0 sec.
- Temperature range: -40°C to +85°C
- Supply voltage: 8.2V to 16V
- Nominal voltage: 12V

Q16. With the help of a neat diagram explain the working principle of Mass Air Flow Sensor.

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



The VAF (volume air flow) sensor measures the air flow into the engine with a spring-loaded air vane (flap/door) attached to a variable resistor (potentiometer). The vane moves in proportion to the airflow. The vane moves because of the drag force of the air flow against it; it does not measure volume or mass directly. The drag force depends on air density (air density in turn depends on air temperature), air velocity and the shape of the vane. A voltage is applied to the potentiometer and a proportional voltage appears on the output terminal of the potentiometer in proportion to the angle the vane rotates, or the movement of the vane may directly regulate the amount of fuel injected.

Q17 What are thermocouples and where they are used in automobiles?

Ans: The thermocouple is a temperature measuring device. It is a type of sensor used for measuring the temperature in the form of an electric current or the EMF. The thermocouple consists two wires of different metals which are welded together at the ends. The variation in temperature of the wire induces the voltages which is known as thermo-emf.

Ex. The Type B thermocouple is used in extremely high temperature applications like measurement of Exhaust Gas and Turbocharger temperatures in a vehicle.

Q18. What are actuators? Give at least three examples of actuators.

Ans: Actuator is a general term to describe a control mechanism. An actuator is part of an open-loop or closed-loop control system which connects the electronic unit with the process. The actuator consists of a transformer and a final-control element. Each positioning signals are converted to mechanical outputs. A wide variety of actuators are used in control loops in an automobile

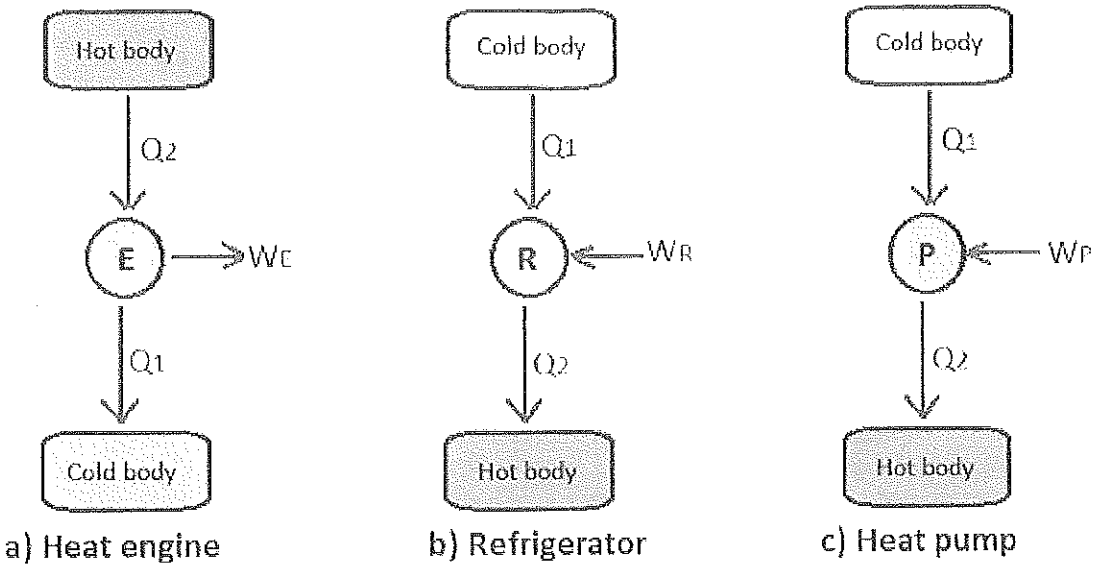
Some of the actuators are:

- Solenoids
- DC Motors
- Stepper motors
- Piezo Actuators and so on..

Section-C

(5x10) = 50 Marks

Ans: 19



Heat engine: Fig c shows diagram of heat heat engine. heat engine took Q2 amount of heat from the hot body and did equivalent to W_E. The heat supplied is equal to Q1. Here the useful effect is work done, W_E equal to Q2-Q1.

Cop of heat engine = work done/heat supplied

Efficiency = Q2-Q1/Q2

Refrigerator

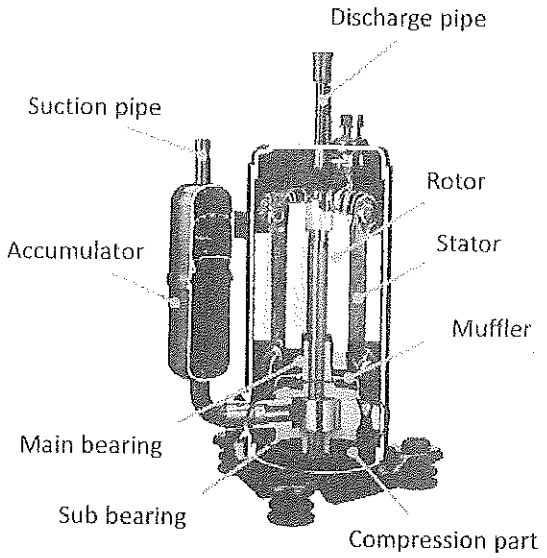
In fig b Q1 amount of heat is extracted from the cold body and deliver Q2 amount of heat to the hot body with the help of input work WR. Then COP of refrigeration is $Q1/W_R = Q1/Q2-Q1$

Heat pump

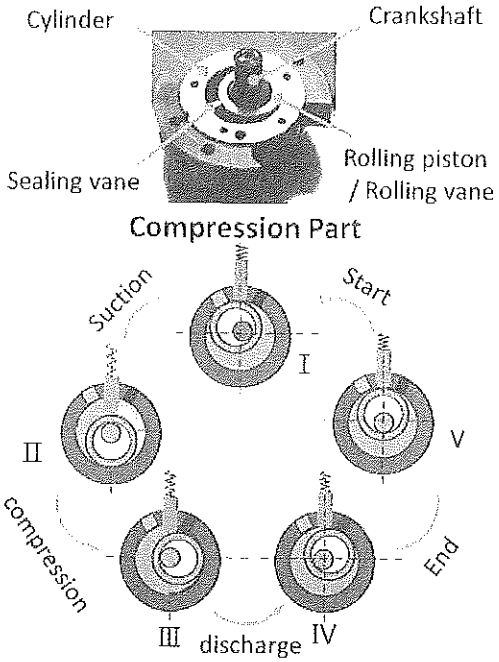
Fig c shows diagram of heat pump. Here desired effect is the heat delivered Q2. COP of refrigerator is $Q2/W_P = Q2/Q2-Q1$

Ans 20 (a): A rotary-vane compressor is also known as a rotary piston compressor because the function of the vane is similar to that of a piston (shown in Figure). The fixed casing is known as a cylinder. The vane splits the space between the cylinder and the rolling piston into two sections (suction and discharge). As the rolling piston rotates these two volumes are increased and decreased to achieve gas suction, compression and discharge. This compressor type can also be sub-classified by the drive speed (constant and variable) and number of vanes. Each operation cycle includes five actions: start, suction, compression, discharge and end. Each crankshaft

rotation can achieve these five actions by average. The capacity can be adjusted through cylinder unloading or inverter drive.



Cut-away View



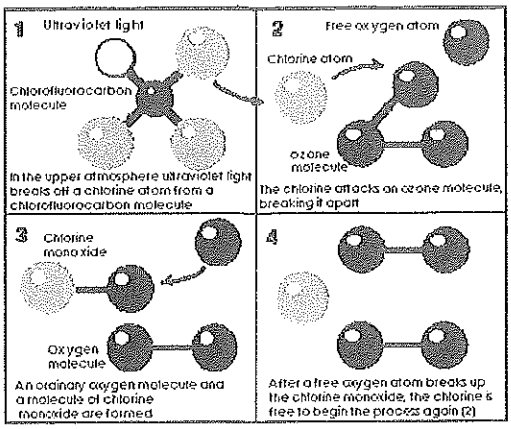
Theory of Operation

20 (b)

a) Recovery
   Recovery is to accumulate refrigerant and compressor oil in a place.
   Place can be a tank in a recovery machine or it can be outdoor unit or a tank in case of a domestic Air-conditioner.
b) Vacuuming:
   It is a process in which air and moisture is removed from the system. It is done with the help of a vacuum pump
c) Recharging
   Process of filling of required amount of refrigerant and compressor oil in the system.
   Amount of refrigerant and compressor oil varies with systems.

Ans: 21 The **ozone depletion potential** (ODP) of a chemical compound is the relative amount of degradation to the ozone layer it can cause, with chlorofluorocarbon (R-11 or CFC-11) being fixed at an ODP of 1.0. for example, has an ODP of 0.05. CFC 11, or R-11 has the maximum potential amongst chlorocarbons because of the presence of three chlorine atoms in the molecule.

Relative value that indicates the potential of a substance to destroy ozone gas as compared with the potential of CFC-11 which is assigned a reference value of 1. Thus, a substance with ODP of 2 is twice as harmful as CFC-11

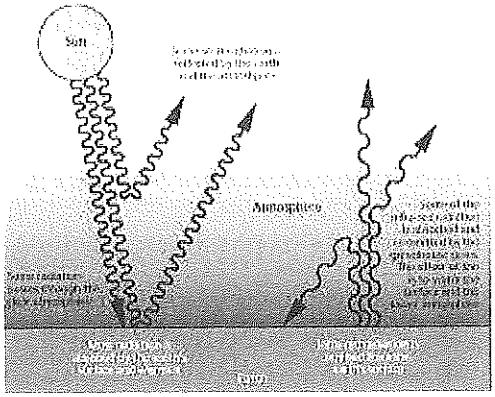


Causes of Ozone depletion: Degradation of halons leaves a free bromine atom that destroys ozone in the same way as chlorine. CFCs and halons last a long time (100 years on average). After it was confirmed that an environmentally disastrous side-effect was taking place in the upper atmosphere, plans and agreements were made to phase out CFCs and halons. However, at the moment CFCs and halons are still being produced and are being put into the stratosphere about 5 times as fast as they can be removed naturally.

Global warming potential (GWP) is a relative measure of how much heat a greenhouse gas traps in the atmosphere. It compares the amount of heat trapped by a certain mass of the gas in question to the amount of heat trapped by a similar mass of carbon dioxide A GWP is calculated over a specific time interval, commonly 20, 100, or 500 years. GWP is expressed as a factor of carbon dioxide (whose GWP is standardized to 1).

The GWP depends on the following factors:

- the absorption of infrared radiation by a given species
- the spectral location of its absorbing wavelengths
- the atmospheric lifetime of the species



Causes of global warming:

Due to burning of fossil fuels which release CO2

Overrlease of fertilizers in farming release NO2

Q22. What are Thermistors? Discuss important factors for accurate measurement and their applications in automobiles.

Ans: Thermistors are commonly used for temperature measurement on vehicles. They are made out of semiconductor materials such as cobalt or nickel oxides. Change in temperature causes change in resistance of the thermistor. Most of the thermistors are of the negative temperature coefficient (NTC) type.

Resistance range – Several Kilo Ohms at 0° C to a few hundred Ohms at 100° C. Thus it can be more sensitive.

Important factors to be considered for accurate measurements:

- Supply must be stable i.e.; voltage should not have any variation in varying load conditions
- Current flowing through the thermistor should be negligible because if considerable amount of current flows through the thermistor than it heat the thermistor and it will affect the accuracy of measurement (i.e. No heating effect)

These devices are commonly used as temperature sensors for:-

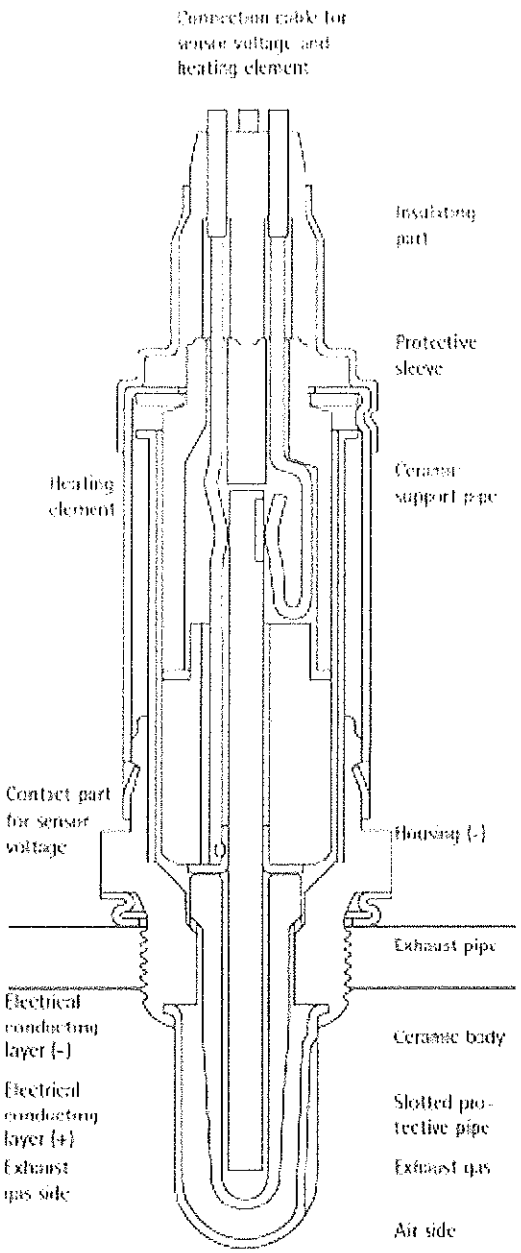
- Air intake
- Battery
- Engine and transmission temperature
- Air conditioning and internal/external environmental temperature
- Oil and gas temperatures.

Q23. Explain principle and construction of Lambda Sensor in details. What do understand by Lambda value of one?

Ans: An oxygen sensor (or **lambda sensor**) is an electronic device that measures the proportion of oxygen (O2) in the gas or liquid being analyzed. The O2 sensor is mounted in the exhaust manifold to monitor how much unburned oxygen is in the exhaust as the exhaust exits the engine. Monitoring oxygen levels in the exhaust is a way of gauging the fuel mixture. It tells the computer if the fuel mixture is burning rich (less oxygen) or lean (more oxygen). It provides the closed loop feedback to the engine management system to control the air fuel ratio.

A 'Stoichiometric' AFR has the correct amount of air and fuel to produce a chemically complete combustion event. For gasoline engines, the stoichiometric, A/F ratio is 14.7:1, which means 14.7 parts of air to one part of fuel. This A/F ratio is also called **Lambda value of one**.

The O2 sensor produces its own voltage when it gets hot. Inside the vented cover on the end of the sensor that screws into the exhaust manifold is a zirconium ceramic bulb. The bulb is coated on the outside with a porous layer of platinum. Inside the bulb are two strips of platinum that serve as electrodes or contacts.



The outside of the bulb is exposed to the hot gases in the exhaust while the inside of the bulb is vented internally through the sensor body to the outside atmosphere. The tiny amount of space between the insulation and wire provides enough room for air to seep into the sensor. Venting the sensor through the wires rather than with a hole in the body reduces the risk of dirt or water contamination that could foul the sensor from the inside and cause it to fail. The difference in oxygen levels between the exhaust and outside air within the sensor causes voltage to flow through the ceramic bulb. The greater the difference, the higher the voltage reading.

An oxygen sensor will typically generate up to about 0.9 volts when the fuel mixture is rich and there is little unburned oxygen in the exhaust. When the mixture is lean, the sensor's output voltage will drop down to about 0.1 volts. When the air/fuel mixture is balanced or at the equilibrium point of about 14.7 to 1, the sensor will read around 0.45 volts.

The oxygen sensor must be hot (about 600 degrees or higher) before it will start to generate a voltage signal, so many oxygen sensors have a small heating element inside to help them reach operating temperature more quickly. The heating element can also prevent the sensor from cooling off too much during prolonged idle, which would cause the system to revert to open loop.

Registration No.....

BSDU

SCHOOL OF AUTOMOTIVE SKILLS

FIRST SEMESTER, END-SEMESTER EXAMINATION

WINTER SEMESTER, B.VOC. PROGRAM- 2017-18

Course Code: AUT1006 **Time: 3 Hour**

Course name: Automotive Workshop Maintenance and Documentation **Max. Marks:100**

Instructions: (i) Attempt all questions from Section A and Section C.

(ii) Attempt any six question from Section B.

Section-A **(2 X 10 = 20)**

1. (a) Hatching lines are drawn at .....degree to reference line (45/60/75/65)
   (b) If a solid is cut by a cutting plane parallel to the base of the solid and top part is removed, the remaining part is called..... (Frustum of Solid/Truncated Solid/Section of Solid/Plane of Solid)
2. (a) Hexagon socket screw keys are made from hexagonal section bars of.....(Aluminium alloy/Chrome Vanadium steel/Mild Steel/High Speed Steel).
   (b).....have a pair of legs joined by a pivot, hinge or fulcrum pin. (spanners/pliers/Wrenches/Snips).
3. (a) Smooth File is used for.....(metal removal/ surface finishing/Joining/Cutting).
   (b) Rough File is used for.....(metal removal/ surface finishing/Joining/Cutting).
4. (a) A point 'P' is above Horizontal Plane (HP) and in front of Vertical Plane (VP). The point is in.....(First Quadrant/Third Quadrant/Second Quadrant/Fourth Quadrant)
   (b) When the line is parallel to both Horizontal Plane (HP) and Vertical Plane (VP), we can get its true length in..... (Front & Top View/ Side View/Angle View/Normal View)
5. (a) In automotive workshop the equipment used for raising the vehicle from ground level to a certain height is known as.....(two-post lift/jib crane/wheel aligner/wheel balancer)
   (b) The equipment used for balancing of wheels is called.....(wheel aligner/wheel balancer/tyre changer/two-post lift).
6. (a).....grinders are fitted to a bench or table and are useful for light duty work. (Pedestal/Bench/Pneumatic/Hand-held).

   (b) Process of making a fresh hole on a work-piece is known as.....(drilling/boring/Pinching/Reaming).

7. (a) Spanners are used for operating.....(Threaded fasteners/Nails/Pins/Studs).

   (b) The angle between top face of cutting point and normal to work surface at cutting edge is known as.....(Clearance/Rake/Nose/Flank) angle.

8. (a) The minimum measurement that can be taken by an instrument is known as.....(minimum count/least count/negative count/positive count)
   (b) Least count of a micrometer Is.....(0.001/0.01/0.1/0.001)
9. (a) Still son pipe wrenches are used for gripping and turning of.....(pipes/bolts/nuts/bolts).

(b) Material used to make a file is.....(high speed steel/mild steel/alloy steel/aluminium alloy).

10. (a) The teeth of a single cut file are at an angle of.....to the center line of file. (60 degree/70 degree/45 degree/75 degree).
    (b) The hacksaw is used to cut.....and contours (slots/splines/sheets/blanks).

Section-B

(5 X 6= 30)

11. Write a short note on: (a) Hammers (b) Torque Wrench
12. Define Engineering Drawing. Why drawing is called universal language of engineers?
13. Define least count. Find out the least count of Vernier calipers and Micrometer.
14. What are the different methods of dimensioning in engineering drawing?
15. What are the purpose and requirements of Clamping device? Draw a neat and labelled sketch of a clamping device.
16. What is an Allen key? Write about the uses, sizes and designation of an Allen Key.
17. What are Mallets? Write about the types and application of different types of mallets.
18. Write a short note and also draw the diagram for each: (a) Wheel base (b) Wheel Track

Section-C

(10 X 5= 50)

19. Explain the following types of chisels with the help of a schematic diagram: (a) Flat Chisel (b) Cross-Cut Chisel (c) Half Round Nose Chisel (d) Web/Punching Chisel
20. Discuss the various types of Marking Punches.
21. Explain the difference between first angle and third angle projections with the help of a diagram. Why the projections of an object are not drawn in second and fourth quadrant?
22. What is the purpose of Locking Devices? State the uses of commonly used locking devices.
23. Classify the different types of hand-held screw driver and their applications.

Registration No.....

BSDU

SCHOOL OF AUTOMOTIVE SKILLS

FIRST SEMESTER, END-SEMESTER EXAMINATION

WINTER SEMESTER, B.VOC. PROGRAM- 2017-18

Course Code: AUT1006 **Time: 3 Hour**

Course name: Automotive Workshop Maintenance and Documentation **Max. Marks:100**

Instructions: (i) Attempt all questions from Section A and Section C.

(ii) Attempt any six question from Section B.

Section-A **(2 X 10 = 20)**

1. (a) Hatching lines are drawn at 45 degree to reference line (45/60)
   (b) If a solid is cut by a cutting plane parallel to the base of the solid and top part is removed, the remaining part is called Frustum of solid (Frustum of Solid/Truncated Solid)
2. (a) Hexagon socket screw keys are made from hexagonal section bars of Chrome Vanadium steel (Aluminium alloy/Chrome Vanadium steel).
   (b)Pliers have a pair of legs joined by a pivot, hinge or fulcrum pin. (spanners/pliers).
3. (a) Smooth File is used for surface finishing (metal removal/ surface finishing).
   (b) Rough File is used for metal removal (metal removal/ surface finishing).
4. (a) A point 'P' is above Horizontal Plane (HP) and in front of Vertical Plane (VP). The point is in First Quadrant.(First Quadrant/Third Quadrant)
   (b) When the line is parallel to both Horizontal Plane (HP) and Vertical Plane (VP), we can get its true length in Front & Top View (Front & Top View/ Side View)
5. (a) In automotive workshop the equipment used for raising the vehicle from ground level to a certain height is known as two-post lift (two-post lift/jib crane)
   (b) The equipment used for balancing of wheels is called wheel balancer (wheel aligner/wheel balancer).
6. (a) Bench.grinders are fitted to a bench or table and are useful for light duty work. (Pedestal/Bench).

   (b) Process of making a fresh hole on a work-piece is known as drilling (drilling/boring).

7. (a) Spanners are used for operating Threaded fasteners (Threaded fasteners/Nails).

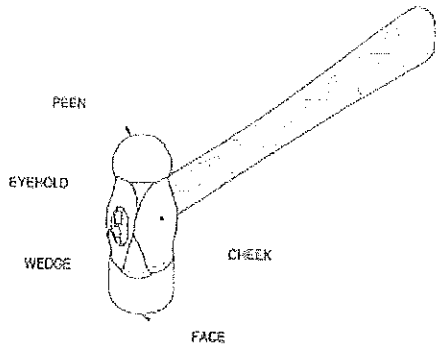
   (b) The angle between top face of cutting point and normal to work surface at cutting edge is known as Rake (Clearance/Rake) angle.

8. (a) The minimum measurement that can be taken by an instrument is known as least count (minimum count/least count)
   (b) Least count of a micrometer Is0.01 (0.001/0.01)
9. (a) Still son pipe wrenches are used for gripping and turning of pipes (pipes/bolts).
   (b) Material used to make a file is high speed steel (high speed steel/mild steel).
10. (a) The teeth of a single cut file are at an angle 60 degree to the center line of file. (60 degree/70 degree).
    (b) The hacksaw is used to cut slots and contours (slots/splines).

Section-B

(5 X 6= 30)

11. (a) Hammers: An engineer's hammer is a hand tool used for striking purposes while: Punching, Bending, Straightening, Chipping, Forging & Riveting. The major parts of hammer are hammer head and a handle The head is made of drop forged carbon steel, while wooden handle must be capable of absorbing shocks. The parts of hammer head are:
    - Face
    - Peen
    - Cheek
    - Eyehole
    - Wedge



(b) Torque Wrench: Torque wrenches acts as a torque limiting device for turning (rotating) nuts to a predetermined degree of tightness. This avoids breaking of fasteners. It is also essential to avoid warping or springing components held by multiple fasteners that could be unevenly or excessively tightened. To apply correct torque with tension wrench:
    - Check that the threads of nut and bolt are clean and well formed
    - Pull slowly with evenly increasing effort on the hand grip of the handle

12. Define Engineering Drawing. Why drawing is called universal language of engineers?
    An engineering drawing, a type of technical drawing, is used to fully and clearly define requirements for engineered items. ... More than merely the drawing of pictures, it is also a language—a graphical language that communicates ideas and information from one mind to another.
13. Define least count. Find out the least count of Vernier calipers and Micrometer.
    The smallest value that can be measured by the measuring instrument is called its least count. Measured values are good only up to this value.
    Divide 1 cm into that much number of divisions; the value obtained is the least count of the main scale in cm. For example, if there are 10 divisions in one centimeter of the main scale its least count = 1/10 = 0.01 cm. Number of divisions on Vernier scale : In most Vernier calipers, the vernier scale has 10 divisions.
    One small division on main scale = 1 mm
    No. of divisions on Vernier scale = 50
    Vernier scale divisions = 49 divisions on main scale (or 49 mm)
    Each division on Vernier scale = (49/50) mm

Difference between one main scale division and one
Vernier scale division = 1 -(49/50) mm= (50 -49)/50= (1/50) mm= 0.02 mm

14. What are the different methods of dimensioning in engineering drawing?
To show dimensions of all parts of drawing is mandatory for engineer. All lines in drawing would have length, width or radius to indicate.
There are two Methods of Dimensions. (1) Uni-directional System :
Step-1 Draw an example drawing as given into the above figure. Drawing should be drawn as per the given dimensions.

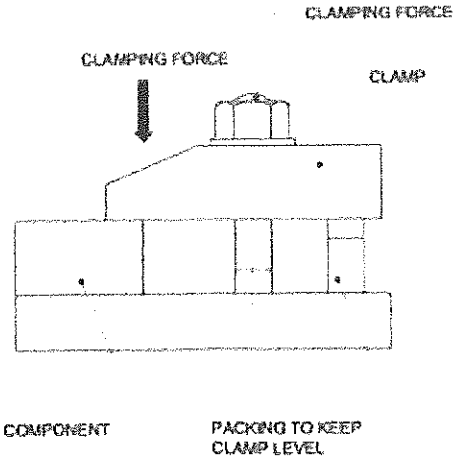
Step-2 In Unidirectional Method of Dimensioning the dimension line should be cut at center and dimensions should be placed in the middle of dimension lines as shown into the figure.

Step-3 At the ends of dimension lines filled arrow heads should be placed.
(2) Aligned System: Step-1 Draw an example drawing as given into the above figure. Drawing should be drawn as per the given dimensions.

Step-2 In Aligned Method of Dimensioning the dimension line should be continuous and dimensions should be placed in the middle of dimension lines as shown into the figure.

Step-3 At the ends of dimension lines filled arrow heads should be placed.

15. What are the purpose and requirements of Clamping device? Draw a neat and labelled sketch of a clamping device.
Clamps are used for preventing the movement of work and for holding the job tight
Requirements of clamping devices
a. Should be able to manipulate for easy loading
b. Should provide the required clamping force
c. Should be capable of locking with minimum movement
d. Should accommodate a range of sizes of jobs
A typical clamping device employs a screw and nut to provide the clamping force.

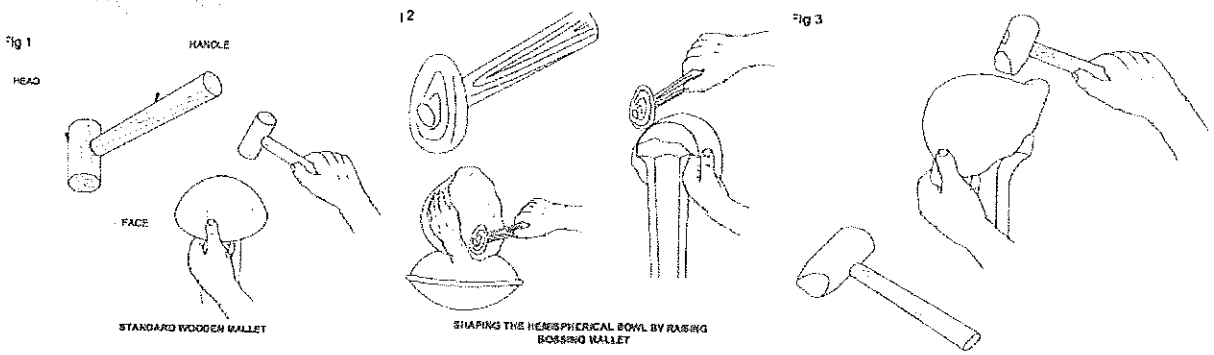


16. What is an Allen key? Write about the uses, sizes and designation of an Allen Key
A hex key, Allen key or Allen wrench is a tool used to drive bolts and screws with hexagonal sockets in their heads.
The tool is simple, small and light

The contact surfaces of the screw or bolt are protected from external damage
There are six contact surfaces between bolt and driver
The tool can be used with a headless screw
The screw can be inserted into its hole using the key
Torque is constrained by the length and thickness of the key
Very small bolt heads can be accommodated
The tool can be manufactured very cheaply, so one is often included with products requiring end-user assembly
Either end of the tool can be used to take advantage of reach or torque
The tool is L-shaped and is often designed to be used with both sides
The tool can be reconditioned using an electric grinder by removing the worn-out part, and then it works like new
The hexagon is typically a smaller diameter than would be used with an external cap, and is more likely to round off its contact surfaces.
It is much more difficult to turn a damaged (rounded or otherwise) internal fastener than an external one.
Standard metric sizes are defined in ISO 2936:2001 "Assembly tools for screws and nuts—Hexagon socket screw keys", also known as DIN 911, and, measured in millimeters (mm) are:

0.7, 0.9, 1.0, 1.25, 1.3, 1.5
2 to 6 in 0.5 mm increments, sometimes incorrectly referred to as M2 to M6 which rather should refer to thread sizes (see below for M1, M2 style designation).
7 to 22 in 1 mm increments
24, 25, 27, 30, 32, 36, 42 and 46 mm.

17. What are Mallets? Write about the types and application of different types of mallets.
Mallets are soft hammers made of raw hide, hard rubber/copper, lead or wood
Standard wooden mallets are used for general purpose work like flattening, bending etc.
Bossing mallets are used for hollow panel beatings etc.
End Faked mallets are used for stretching, hammering etc.



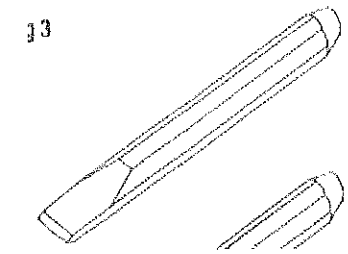
18. Write a short note and also draw the diagram for each: (a) Wheel base (b) Wheel Track

Section-C

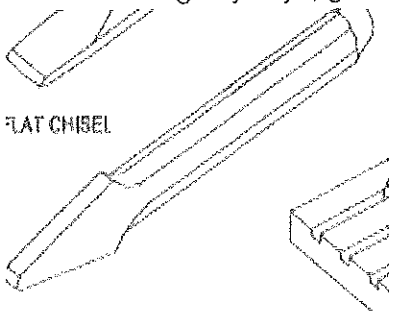
(10 X 5= 50)

19. Explain the following types of chisels with the help of a schematic diagram: (a) Flat Chisel (b) Cross-Cut Chisel (c) Half Round Nose Chisel (d) Web/Punching Chisel

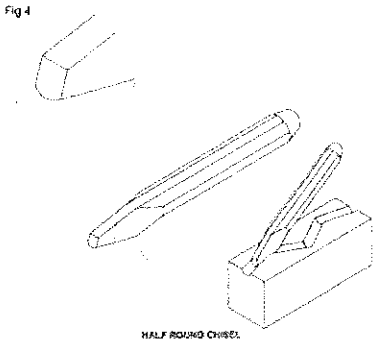
(a) Flat Chisel: They are used to remove the metal from large flat surfaces and to chip excess metal from weld joints and castings.



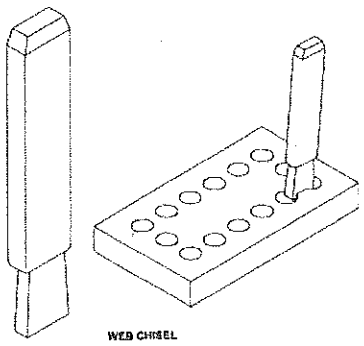
(b) Cross-Cut Chisel: They are used for cutting keyways, grooves and slots.



(c) Half Round Nose Chisel: Half Round Nose chisels are used or cutting grooves



(d) Web/Punching Chisel: Web/ Punching Chisels are used for separating metals after chain drilling

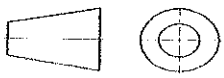
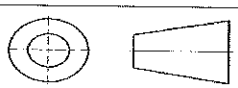
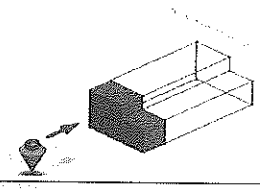
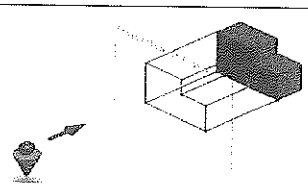
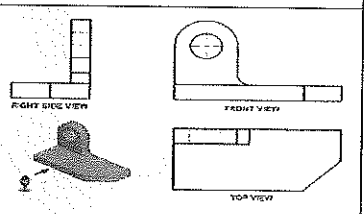
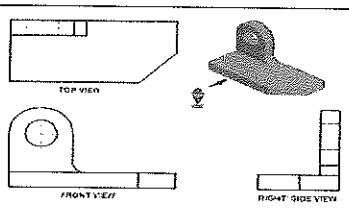


20. Discuss the various types of Marking Punches.

A punch is a hard metal rod with a sharp tip at one end and a blunt butt end at the other, which is usually struck by a hammer. Typically, woodworkers use a ball-peen hammer to strike a punch.

- Metal pins and similar connectors are driven in or out of holes using a pin punch.For removal, first use a starter punch to loosen the pin, then use a pin punch to finish.
- A center punch is used to mark the center of a point. It is usually used to mark the center of a hole when drilling holes. A drill has the tendency to "wander" if it does not start in a recess. A center punch forms a large enough dimple to "guide" the tip of the drill. The tip of a center punch has an angle between 60 and 90 degrees
- A prick punch is similar to a center punch but used for marking out. It has a sharper angled tip to produce a narrower and deeper indentation. The indentation can then be enlarged with a center punch for drilling.

21. Explain the difference between first angle and third angle projection with the help of a diagram. Why the projections of an objects are not drawn in second and fourth quadrant?

First Angle Projection	Third Angle Projection
The object is imagined to be in first quadrant.	The object is imagined to be in third quadrant.
The object is lies between the observer and plane of projection.	The plane of projection lies between the observer and object.
The plane of projection is assumed to be non transparent.	The plane of projection is assumed to be transparent.
When view are drawn in their relative position Top view comes below Front view, Right side view drawn to the left side of elevation.	When view are drawn in their relative position Top view comes above Front view, Right side view drawn to the right side of elevation.
 SYMBOL	 SYMBOL
	
	

22. What is the purpose of Locking Devices? State the uses of commonly used locking devices.
A locking device is a mechanical component that prevents mated shafts and other machine elements from moving out of position when subjected to external forces. Operating conditions such as initial installation error, temperature variations, vibration and others can all cause issues. These are critical components. The safety of an entire system often relies on locking devices. They are common in systems that require coupling multiple components.
Locking devices can be acting positively, non-positively or by the retention of self-substance.

Locking devices, particularly cotter pins, spring rings and toothed washers, are used only once. Use new, unused locking devices when re-assembling parts which have been dismantled. Locking devices, once used, will deform permanently and not be safe to use another time.

Non-positive locking devices

These are available mainly as spring lock washers and toothed washers. They maintain a slight tension between the bolt, or nut, and the component to which they are fastened.

The sharp edges on the spring lock washers and toothed lock washers have a "seizing" effect on the component tightened in the joint, thus preventing it from coming loose accidentally.

An additional locking effect can be obtained on bolts with a long, projecting shank by screwing a counternut on the projecting shank. Both nuts must be screwed sufficiently tight. The friction on the thread flanks prevents the nuts from coming loose.

Positive locking devices

These are available mainly as locking plates, retaining rings and crown nuts with split pins. They are used primarily with hexagon head screws and where their shape prevents the joint from coming loose.

Locking plates and retaining rings are provided with tangs or lugs, which are fastened to the component in the joint and the connecting part by blows with a hammer. When crown nuts are used, a hole must be drilled through the threaded portion, which takes up the cotter pin, after nut has been tightened.

Locking by retention of self-substance

The locking effect is achieved by the application of paint, varnish or paste. Used primarily on electrical assemblies and in precision instruments. Where the forces acting on the joint are slight, the locking effect is sufficiently strong and provides protection against tampering.

23. Classify the different types of hand-held screw driver and their applications.

A screwdriver is a tool, manual or powered, for screwing and unscrewing (inserting and removing) screws. A typical simple screwdriver has a handle and a shaft, ending in a tip the user puts into the screw head before turning the handle. The shaft is usually made of tough steel to resist bending or twisting. The tip may be hardened to resist wear, treated with a dark tip coating for improved visual contrast between tip and screw—or ridged or treated for additional 'grip'. Handles are typically wood, metal, or plastic and usually hexagonal, square, or oval in cross-section to improve grip and prevent the tool from rolling when set down.

24.