BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 1st Semester,

End-Sem. Examination

Course Code: AUT1101 **Time: 2 Hours**

Course Name: Automotive Power Train, Chassis & Suspension **Max. Marks: 50**

Instruction:

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

Section – A

10X01 = 10 Marks

1. Full form of ECU is...
   a) Engine control unit
   b) Electronic connection unit
   c) Electrical control unit
   d) Electric connection unit
2. When piston is at BDC, the volume contained in the cylinder above the top of the piston is called...
   a) Swept volume
   b) Clearance volume
   c) Total cylinder volume
   d) None of these
3. Hydraulic braking system works on the principle of...
   a) Pascal's law
   b) Gas law
   c) Both a & b
   d) None of the above.
4. The correct flow of power through a drive train is:
   a) Engine- gearbox- clutch- differential- propeller shaft- axle- wheels.
   b) Engine- propeller shaft- gearbox- axle- clutch- differential- wheels
   c) Engine- clutch- gearbox- propeller shaft- axle- differential, wheels
   d) Engine- clutch- gearbox- propeller shaft- differential- axle- wheels.
5. Which one is not a part of disc brake system?
   a) Caliper
   b) Brake pad
   c) Drum
   d) All of the above
6. In a four stroke engine the working cycle completes in...
   a) One revolution of crankshaft
   b) Two revolution of crankshaft
   c) three revolution of crankshaft
   d) All of the above

7. In a diesel engine, the function of a fuel injector is to:
   a) Mix the air and fuel
   b) Ignite the air-fuel mixture
   c) Spray atomized fuel in the cylinder
   d) Provide flame for ignition
8. The motion of the camshaft is transferred to the valves through...
   a) Rocker arm
   b) Piston
   c) Spring
   d) Bearing
9. The purpose of hydraulic fluid in braking system is to...
   a) Flow
   b) Multiply the force applied by driver using Pascal's law
   c) Both a & b
   d) Repair the pipeline
10. Full form of CI engine is...
   a) Combustion ignition engine
   b) Controlled ignition engine
   c) Compression ignition engine
   d) None of these

Section – B

04X04 = 16 Marks

11. Write down different parts of suspension system.
12. Between 2-stroke and 4- stroke petrol engine, which one generates more power in single cycle and how?
13. Explain hydraulic braking system.
14. Define IC engine? Explain the working of Otto cycle.

Section – C

04X06 = 24 Marks

15. Explain the process of power transfer from engine to wheels.
16. Explain Suspension system of a vehicle.
17. Explain All wheel drive vehicle with the help of a diagram.
18. Explain ABS and its components.

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10X01 = 10 Marks

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   - c) Electrical control unit
   - b) Electronic connection unit
   - d) Electric connection unit
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   - a) Swept volume
   - **c) Total cylinder volume**
   - b) Clearance volume
   - d) None of these
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   - **a) Pascal's law**
   - c) Both a & b
   - b) Gas law
   - d) None of the above.
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   - b) Engine- propeller shaft- gearbox- axle- clutch- differential- wheels
   - c) Engine- clutch- gearbox- propeller shaft- axle- differential, wheels
   - **d) Engine- clutch- gearbox- propeller shaft- differential- axle- wheels.**
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   - a) One revolution of crankshaft
   - c) three revolution of crankshaft
   - b) **Two revolution of crankshaft**
   - d) All of the above

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   d) Provide flame for ignition
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   a) **Rocker arm**
   c) Spring
   b) Piston
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   b) **Multiply the force applied by driver using Pascal's law**
   d) Repair the pipeline
10. Full form of CI engine is...
   a) Combustion ignition engine
   c) **Compression ignition engine**
   b) Controlled ignition engine
   d) None of these

Section – B

04X04 = 16 Marks

11. Write down different parts of suspension system.

Ans. The following parts are of suspension system:

- Shock Absorber
- Strut
- Suspension arm
- Suspension frame
- Stabilizer Bar

12. Between 2-stroke and 4- stroke petrol engine, which one generates more power in single cycle and how?

Ans. The 2 stroke engine generates more power as it completes one cycle in one revolution of crankshaft.

Though there will be more loss in terms of pollution, mechanical and others.

13. Explain hydraulic braking system.

Ans.

- 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.
- 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.

14. Define IC engine? Explain the working of Otto cycle.

Ans. An IC engine is an internal combustion engine. The otto cycle is an constant volume cycle, in the which the cycle completes in four process.

1. Suction
2. Compression
3. Power
4. Exhaust

Section – C

04X06 = 24 Marks

15. Explain the process of power transfer from engine to wheels.

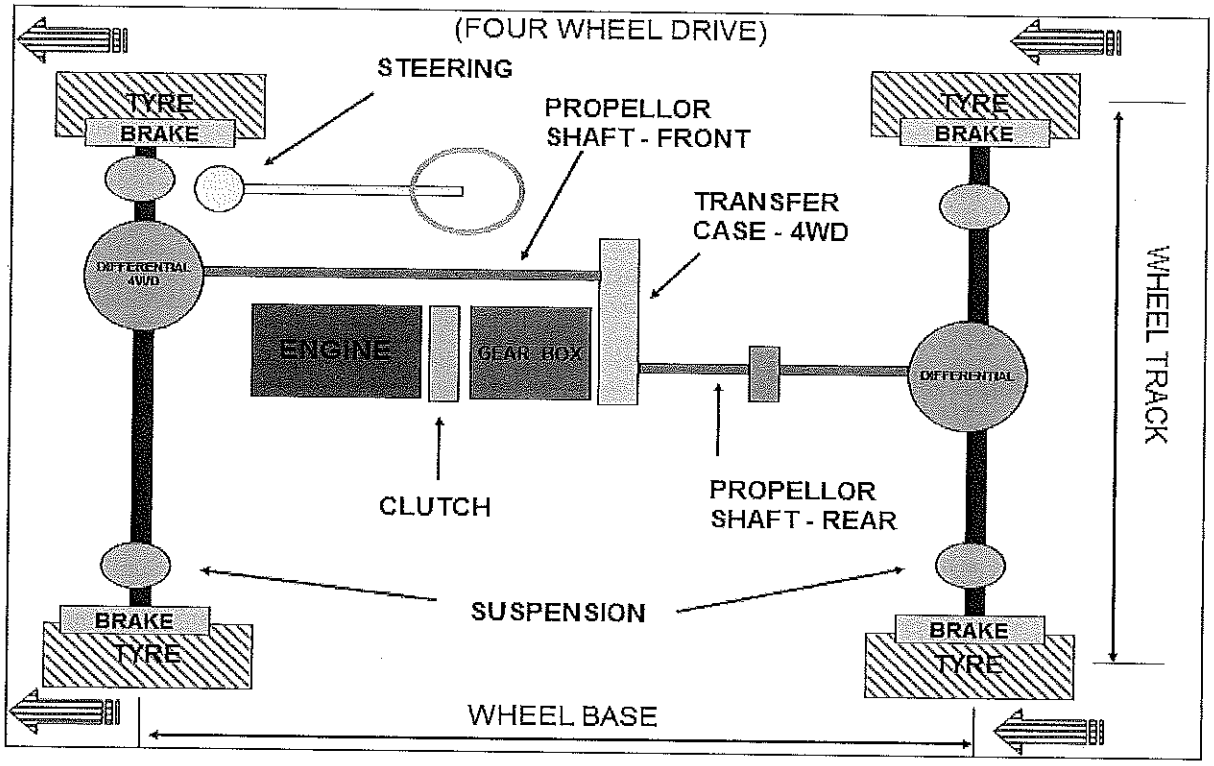
Ans. The power generates in the engine.

- The power then goes into flywheel
- Then the power according to the engagement of the clutch goes into the transmission system
- Then according to the selection gear the power into the differential in FWD.
- Then in case of RWD the power fist goes into propeller shaft then into differential.
- Then after differential the power goes into the drive axles.
- Then finally the power goes into the wheels.

16. Explain Suspension system of a vehicle.

- Ans. It prevents the vehicle body & frame from road shocks.
- It gives stability of the vehicle.
- It reacts like a safe guard of passenger and goods from road shocks.
- It gives cushioning effect.
- It provides comfort.

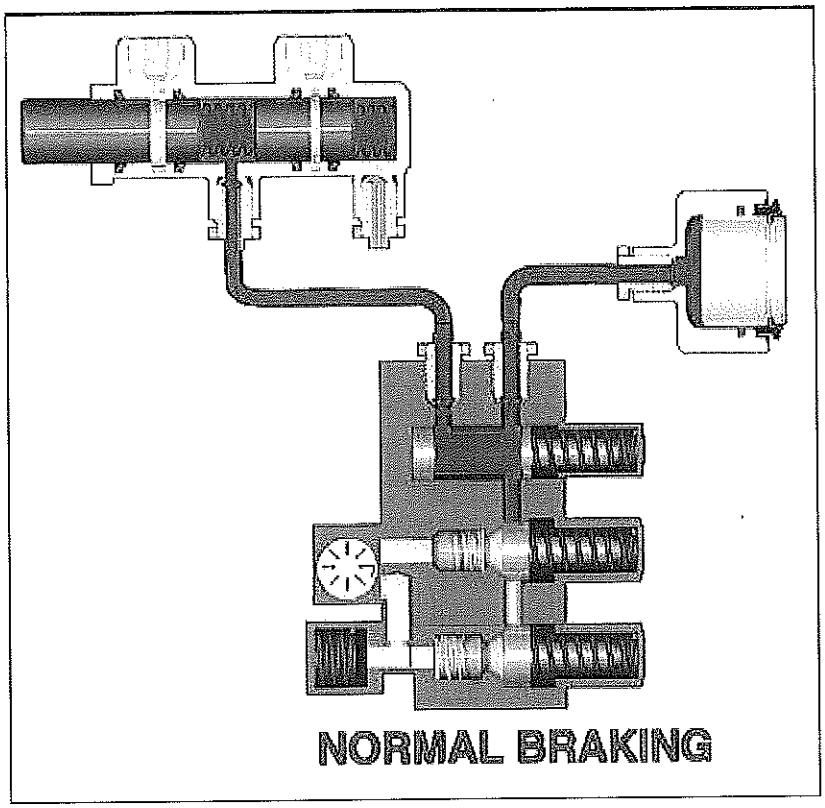
17. Explain All wheel drive vehicle with the help of a diagram.



18. Explain ABS and its components.

- Ans. 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.


NORMAL BRAKING

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

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B. Voc. Program, 1st Semester,

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Section – A

10X01 = 10 Marks

1. The main function of crankshaft is to:
   a) Control the exhaust gas
   b) Convert reciprocating motion into rotatory motion.
   c) Cools the intake air to a suitable temperature
   d) Operates valve
2. The full form of BDC is :
   a) Bottom dead center
   b) Bottom direct center
   c) Both dead center
   d) All of the above
3. The petrol engines are also known as:
   a) Spark ignition (S.I) engines
   b) Compression ignition (C.I) engines
   c) Steam engines
   d) None of the above.
4. The correct flow of power through a drive train is:
   a) Engine- gearbox- clutch- differential- propeller shaft- axle- wheels.
   b) Engine- propeller shaft- gearbox- axle- clutch- differential- wheels
   c) Engine- clutch- gearbox- propeller shaft- axle- differential, wheels
   d) Engine- clutch- gearbox- propeller shaft- differential- axle- wheels.
5. The petrol engine works on:
   a) Otto cycle
   b) Diesel cycle
   c) Carnot cycle
   d) Rankine cycle

6. The connecting rod is connected to the piston by...
   a) Cap bolt
   b) Gudgeon pin
   c) Ball bearing
   d) Screw
7. The function of a spark plug is to:
   a) Mix the air and fuel
   b) Ignite the air-fuel mixture
   c) Spray atomized fuel in the cylinder
   d) Provide flame for ignition
8. Which one is not a part of drum brake?
   a) Drum
   b) Caliper
   c) Brake shoe
   d) Brake Cylinder
9. The purpose of break bleeding is to...
   a) Remove the air from pipeline
   b) Fill the brake fluid in the pipeline
   c) Both a & b
   d) Repair the pipeline
10. A gear assembly, which converts the rotational motion into linear motion is called...
    a) Spur gear
    b) Helical gear
    c) Rack & pinion
    d) Worm gear

Section – B

04X04 = 16 Marks

11. Write any six differences between 2-stroke and 4- stroke petrol engine.
12. What is the suspension system? Explain the function of suspension system.
13. Explain the functions of clutch.
14. What are the various safety practices that must be followed in an automobile workshop?

Section – C

04X06 = 24 Marks

15. What is the role of a technician in workshop? Explain the procedure of general service of a vehicle.
16. Explain single plate and multi-plate clutch system.
17. Explain the PV diagram of otto and diesel cycle.
18. Explain Hydraulic braking system.

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    b) Helical gear
    c) **Rack & pinion**
    d) Worm gear

Section – B

04X04 = 16 Marks

11. Write any six differences between 2-stroke and 4- stroke petrol engine.

Ans.

S.NO.	Two stroke Engine	Four stroke
1.	When the cycle is completed in one revolution of crankshaft , it is called as 2-stroke cycle engine.	When the cy stroke cycle
2.	One power stroke for each revolution of the crankshaft.	One power s
3.	There are inlet and exhaust ports in the engine.	There are inl
4.	The crankshaft is fully closed and also it is air tight.	The cranksh
5.	Size of the flywheel is comparatively smaller.	Size of the fl

6.	Removal of exhaust gases comparatively difficult.	Removal of e
7.	Mostly high speed engines are in this type.	All speed typ

12. What is the suspension system? Explain the function of suspension system.

Ans. It prevents the vehicle body & frame from road shocks.

- It gives stability of the vehicle.
- It reacts like a safe guard of passenger and goods from road shocks.
- It gives cushioning effect.
- It provides comfort.

13. Explain the functions of clutch.

Ans. The major function of clutch is to cut of the power from engine to gearbox whenever needed, it is also used for the smooth engagement of the gears.

14. What are the various safety practices that must be followed in an automobile workshop?

Ans. Follow 5S.

- Always wear safety.
- Follow SOP for every practical.
- Follow guidelines provided by trainers.
- Do not use flammable products near welding and grinding areas.

Section – C

04X06 = 24 Marks

15. What is the role of a technician in workshop? Explain the procedure of general service of a vehicle.

Ans.

- Perform basic care and maintenance, including changing oil, checking fluid levels, and rotating tires.
- Repair or replace worn parts, such as brake pads and wheel bearings.
- Disassemble and reassemble parts of Automotive Vehicles.
- Use testing equipment to ensure that repairs and maintenance are effective
- Explain to clients their automotive problems and the repairs done on their vehicles

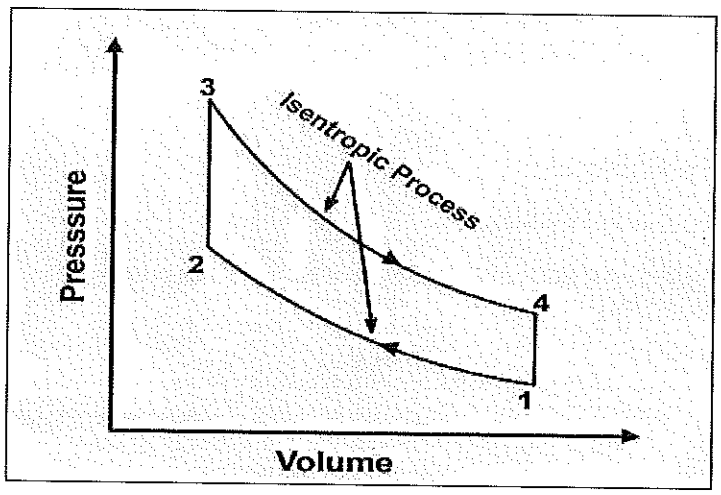
16. Explain single plate and multi-plate clutch system.

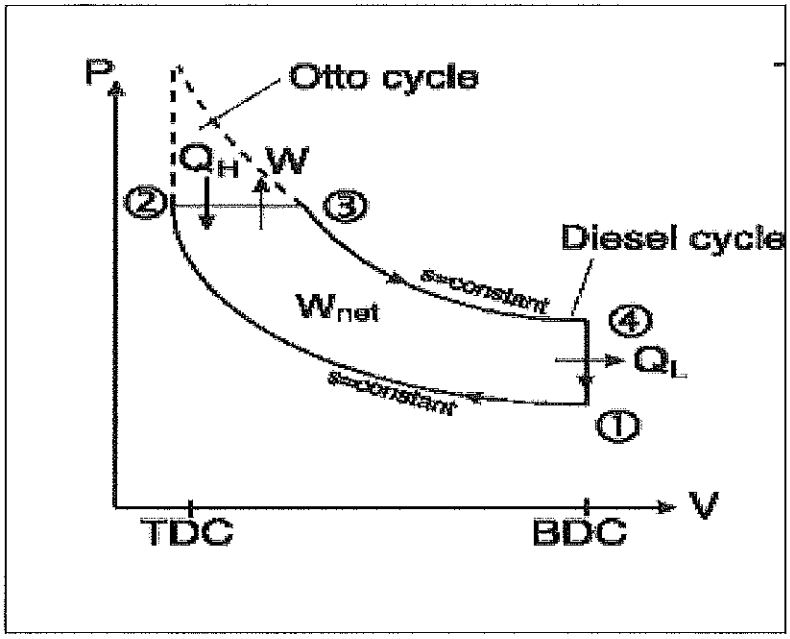
Ans.

Single Plate Clutch	Multi-plate Clu
As the name suggests, single plate clutch consists of a clutch plate whose both sides are coated with a frictional material.	The multi Plate
Torque transmitting capacity is less.	High torque trar
Heat generation is less, so there is no need of a cooling medium. It is called "dry clutches."	Heat generatior medium and ref
The coefficient of friction is high.	The coefficient
Single plate clutch used where large radial space available. e.g. Trucks ,Cars	Multiple Disc cl Motorcycle, Sc

17. Explain the PV diagram of otto and diesel cycle.

Ans.





18. Explain 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.
- Hydraulic brake works on Pascal law.
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School of Automotive Skill

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B. Voc., 1st Semester

End-Sem Examination

Course Code : AUT1102 **Time : 2 Hour**

Course Name: Automotive Wheel Care & Steering System **Max. Marks : 50**

Instructions:

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

Section – A

10X01 = 05 Marks

Q 1. What is the full form of TWI?
a. Tread wear indicator.
b. Tire wear indicator.
c. Tread worn indicator.
d. Tire worn indicator.

Q 2. The main function of steering pump is:
a. To provide force.
b. To provide pressure.
c. To provide torque.
d. To provide load.

Q 3. During changing the tire on tire changer which type of liquid is applied on the tires to reduce the wear & tear on the ply of tire:
a. Oil.
b. Diesel.
c. Kerosene.
d. Tire lube.

Q 4. What is the best temperature to use summer tire?
a. Below +8°C.
b. Above + 8°C.
c. Above +7°C.
d. Below +7°C.

Q 5. Which mechanism is used for bead breaking in tire changer machine?
a. Electrical.
b. Mechanical.
c. Pneumatic.
d. None of these.

Q 6. Which type of plier is used to mount counter weight?
a. Pincers.
b. Needle nose pliers.
c. Lineman's pliers.
d. Weight plier

Q 7. Function of tread in a tire is:
a. To give better look.
b. To provide friction.
c. To give structural support.
d. To improve strength.

Q 8. Which equipment is used to balance wheel of the vehicles?
a. Tire changer.
b. Wheel alignment.
c. Wheel balancer.
d. Tire inflator.

Q 9. What are the angles considered during wheel alignment?
a. Castor.
b. Camber.
c. Toe.
d. All of the above.

Q 10. Function of grooves in tyre is to:
a. Provide a better look.
b. Provide air or water flow.
c. Give structural support.
d. None of these.

Section – B

04X04 = 16 Marks

Q 1. What are the safety equipment used in wheel care section?

Q 2. Explain the role & responsibilities of a wheel care technician in an automotive workshop.

Q 3. Write briefly about requirement of good steering system.

Q 4. What are the difference between summer tire and winter tire?

Section – C

04X06 = 24 Marks

Q 1. Write briefly about the components of a steering system of an automobile.

Q 2. Explain Camber, Caster and Toe Angle with the help of diagrams.

Q 3. What are the steps involved to ensure accurate wheel alignment measurement?

Q 4. What is Wheel Balancing? Also write the advantages of wheel balancing.

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Section – A

10X01 = 05 Marks

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a. Provide a better look.
b. Provide air or water flow.
c. Give structural support.
d. None of these.

Section – B

04X04 = 16 Marks

Q 1. What are the safety equipment used in wheel care section?

Ans. 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.

Q 2. Explain the role & responsibilities of a wheel care technician in an automotive workshop.

Ans. An automotive service technician (or auto mechanic) is someone who inspects, maintains, repair and replace like tyre brake etc.

1. Test parts and systems to ensure they are working properly
2. Identify mechanical problems, often by using computerized diagnostic equipment
3. Follow checklists to ensure that all critical parts are examined
4. Perform basic care of tire rotations
5. Repair or replace worn parts, such as brake pads and wheel bearings
6. Disassemble and reassemble parts
7. Use testing equipment to ensure that repairs and maintenance are effective
8. Explain to clients their automotive problems and the repairs done on their vehicles.

Q 3. Write briefly about requirement of good steering system.

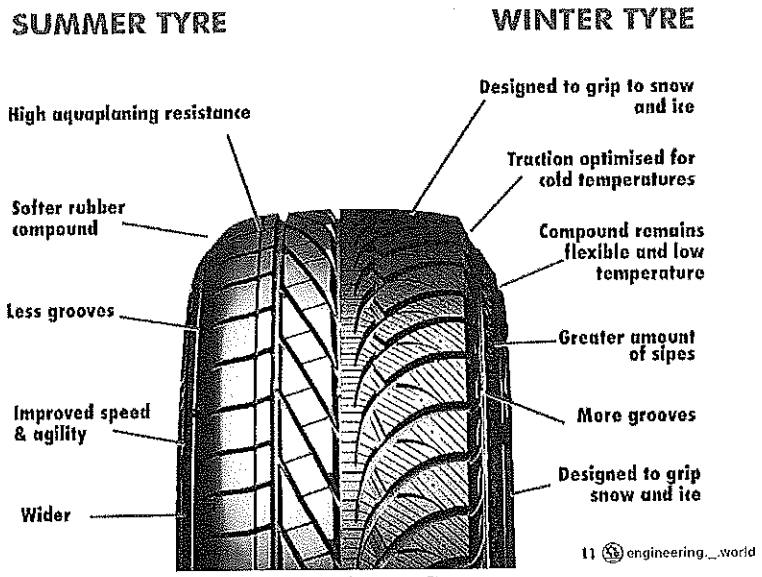
Ans. Following are the requirements of a good steering system:

a. Very accurate.
b. Easy to handle.
c. Provide directional stability.
d. Multiply the turning effort applied on the steering wheel by the driver.
e. Irreversible to a certain degree, so that the shocks of the road surface encountered by the wheels are not transmitted to driver's hands.

Ans.

Q 4. What are the difference between summer tire and winter tire?

Ans.



Section – C

04X06 = 24 Marks

Q 1. Write briefly about the components of a steering system of an automobile.

- Ans. 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.

Q 2. Explain Camber, Caster and Toe Angle with the help of diagrams.

Ans. Caster:

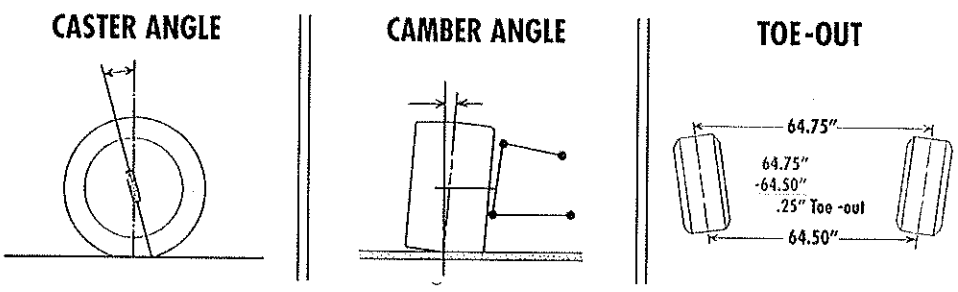
- This angle shows the forward or backward slope of a line drawn through the upper and lower steering pivot points, when viewed directly from the side of the vehicle.
- Also expressed in degrees, caster is measured by "comparing a line running through the steering system's upper and lower pivot points 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 center.
- 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 centerline of the vehicle, when viewed from directly above. Toe can be expressed in either degrees or fractions of an inch.



Q 3. What are the steps involved to ensure accurate wheel alignment measurement?

Answer:

1. Centre the vehicle on the alignment rack.
2. Push down on the front and rear bumper three times.
3. Install the alignment heads to the vehicle.
4. Select the program on the alignment equipment.
5. Compensate, level, and lock all of the alignment equipment.
6. Measure caster, camber & toe angles and record the same.
7. Compare the measurements to the specifications mentioned in the service manual.
8. As per the specifications, adjust the below as required:
    a. Adjust turning angle.
    b. Adjust front and rear camber as per the specs mentioned.
    c. Adjust the toe as the specs mentioned.
    d. Lower the vehicle from the alignment rack.

Q 4. What is Wheel Balancing? Also write the advantages of wheel balancing.

Ans. Step 1: 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 tires 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.

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skill

Session: 2021-22 (Summer Semester)

B. Voc., 1st Semester

End-Sem Examination

Course Code : AUT1102 **Time : 2 Hour**

Course Name: Automotive Wheel Care & Steering System **Max. Marks : 50**

Instructions:

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

Section – A

Q 1. The main function of steering pump is:
a. To provide force.
b. To provide pressure.
c. To provide torque.
d. To provide load.

Q 2. During changing the tire on tire changer which type of liquid is applied on the tires to reduce the wear & tear on the ply of tire:
a. Oil.
b. Diesel.
c. Kerosene.
d. Tire lube.

Q 3. What is the best temperature to use winter tire?
a. Below +8°C.
b. Above + 8°C.
c. Above +7°C.
d. Below +7°C.

Q 4. Which mechanism is used for turn table in tire changer machine?
a. Electrical.
b. Mechanical.
c. Pneumatic.
d. None of these.

Q 5. Which type of hammer is used to mounting tire on rim weight?
a. Ball hammer.
b. Crow hammer.
c. Nose pin hammer.
d. Mallet

Q 6. What is the full form of TWI?
a. Tread wear indicator.
b. Tire wear indicator.
c. Tread worn indicator.
d. Tire worn indicator.

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Q 7. Function of tread in a tire is:

a. To give better look.
b. To provide friction.
c. To give structural support.
d. To improve strength.

Q 8. Which equipment is used to change the alignment of the vehicles?

a. Tire changer.
b. Wheel alignment.
c. Wheel balancer.
d. Tire inflator.

Q 9. What are the angles considered when wheel is away/near to driver during wheel alignment?

a. Castor.
b. Camber.
c. Toe.
d. All of the above.

Q 10. Function of grooves in tyre is to:

a. Provide a better look.
b. Provide air or water flow.
c. Give structural support.
d. None of these.

Section – B

04X04 = 16 Marks

Q 1. What are the safety equipment used in wheel care section?

Q 2. Explain the role & responsibilities of a wheel Alignment technician in an automotive workshop.

Q 3. Write briefly about requirement of good steering system.

Q 4. What are the difference between hydraulic steering and electric steering system?

Section – C

04X06 = 24 Marks

Q 1. Write briefly about the components of a steering system of an automobile.

Q 2. Explain the causes of misaligned wheels and consequences in each case.

Q 3. What are the steps involved to ensure accurate wheel alignment measurement?

Q 4. What is Wheel alignment? Also write the advantages of wheel Alignment.

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skill

Session: 2021-22 (Summer Semester)

B. Voc., 1st Semester

End-Sem Examination

Course Code : AUT1102 **Time : 2 Hour**

Course Name: Automotive Wheel Care & Steering System **Max. Marks : 50**

Instructions:

1. Answer all questions from section A, each question carries one mark.
2. Answer all questions from section B, each question carries two mark.
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b. To provide pressure.
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a. Oil.
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a. Provide a better look.
b. Provide air or water flow.
c. Give structural support.
d. None of these.

Section – B

04X04 = 16 Marks

Q 1. What are the safety equipment used in wheel care section?

Ans. 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.

Q 2. Explain the role & responsibilities of a wheel care technician in an automotive workshop.

Ans. An automotive service technician (or auto mechanic) is someone who inspects, maintains, repair and replace like tire brake etc.

1. Test parts and systems to ensure they are working properly
2. Identify mechanical problems, often by using computerized diagnostic equipment
3. Follow checklists to ensure that all critical parts are examined
4. Perform basic care of tire rotations
5. Repair or replace worn parts, such as brake pads and wheel bearings
6. Disassemble and reassemble parts
7. Use testing equipment to ensure that repairs and maintenance are effective
8. Explain to clients their automotive problems and the repairs done on their vehicles.

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Q 3. Write briefly about requirement of good steering system.

Ans. Following are the requirements of a good steering system:

a. Very accurate.
b. Easy to handle.
c. Provide directional stability.
d. Multiply the turning effort applied on the steering wheel by the driver.
e. Irreversible to a certain degree, so that the shocks of the road surface encountered by the wheels are not transmitted to driver's hands.

Q 4. What are the difference between hydraulic steering and electric steering system?

Ans. **Electric power steering provides better fuel economy**

This method reduces the amount of weight in the vehicle. Also, the EPS system doesn't use power from the engine as the hydraulic systems do. Overall, the electric power steering system is more efficient. The Electric power steering simply uses a electric motor to direct the steering commands made by the driver easily whereas, a **Hydraulic power steering uses pumps and piston for the same**. few cars with hydraulic steering are still available on the mass market, and most that do are **light trucks**, such as the Toyota Tacoma. One the performance car side of things, one of the only options remaining is the Subaru WRX Sti.

Section – C

04X06 = 24 Marks

Q 1. Write briefly about the components of a steering system of an automobile.

Ans. 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.

Q 2. Explain Camber, Caster and Toe Angle with the help of diagrams.

Ans. Caster:

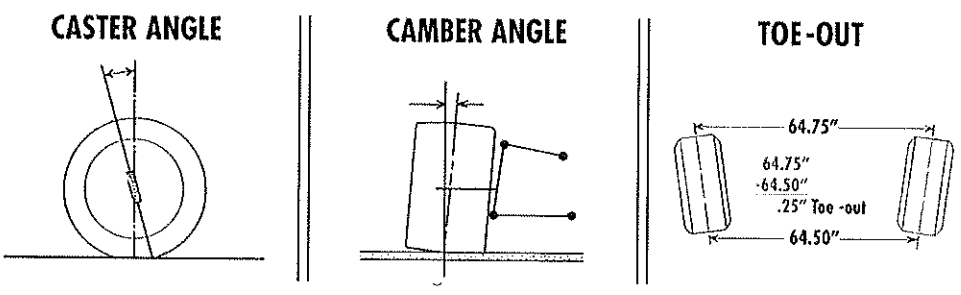
- This angle shows the forward or backward slope of a line drawn through the upper and lower steering pivot points, when viewed directly from the side of the vehicle.
- Also expressed in degrees, caster is measured by "comparing a line running through the steering system's upper and lower pivot points 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 center.
- 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 centerline of the vehicle, when viewed from directly above. Toe can be expressed in either degrees or fractions of an inch.



Q 3. What are the steps involved to ensure accurate wheel alignment measurement?

Answer:

1. Centre the vehicle on the alignment rack.
2. Push down on the front and rear bumper three times.
3. Install the alignment heads to the vehicle.
4. Select the program on the alignment equipment.
5. Compensate, level, and lock all of the alignment equipment.
6. Measure caster, camber & toe angles and record the same.
7. Compare the measurements to the specifications mentioned in the service manual.
8. As per the specifications, adjust the below as required:
    a. Adjust turning angle.
    b. Adjust front and rear camber as per the specs mentioned.
    c. Adjust the toe as the specs mentioned.
    d. Lower the vehicle from the alignment rack.

Q 4. What is Wheel alignment? Also write the advantages of wheel Alignment.

Ans. Camber

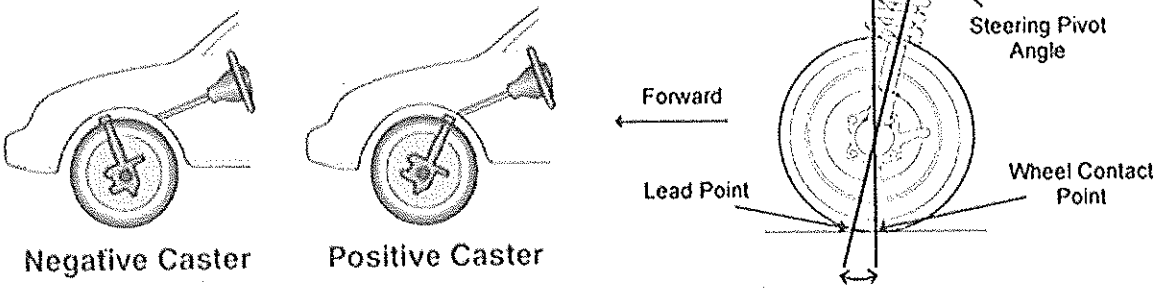
Consequences of camber misalignment:

1. Premature tire wear on one side of the thread
2. Pulling problem to the more positive camber

Reasons for camber misalignment:

1. Vehicle involved in accident
2. Springs sag causing change in ride height
3. Ball joints or other attached parts are worn or defective

Did you know? The camber on most front wheel drive vehicles is not adjustable. Worn out parts will need to be replaced in order to adjust the camber back to its original manufacturer settings.

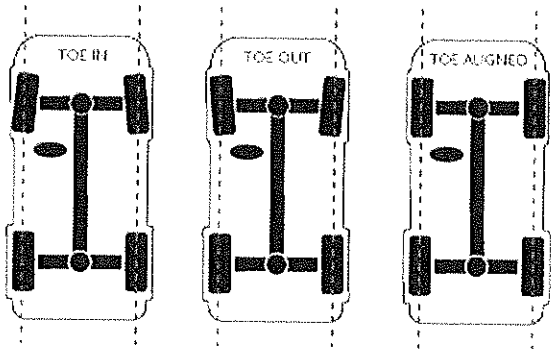


Caster

Consequences of caster misalignment:

1. Problems in straight line tracking, vehicle will pull to the less positive caster
2. Poor return ability of the steering wheel when it spins back to the straight ahead position
3. A caster too positive will result in a heavy steering
4. A caster too negative will provide lighter steering but vehicle will wander and have difficulties keeping in a straight line

Did you know? Caster has no effect on tire wear. Caster is also not adjustable for most front wheel drive vehicles. Parts will need to be replaced in order to achieve manufacturer settings.



Toe

The vehicle's toe is the most critical alignment settings that affect tire wear. A slight misalignment of the toe will result in a reduction in tire life.

For minimum tire wear and power loss, the wheels of a vehicle should be pointing straight ahead. So why most vehicles have their front wheels toe-in? This is to ensure directional stability

1. Increase toe in can reduce oversteer, steady the car and enhance high speed stability
2. Increase toe out will reduce understeer and free up the car

I don't get my wheels aligned

1. Spending a lot more on tires as they wear a lot faster
2. Poor handling of vehicle

wheel alignment help my vehicle

1. Optimal drivability
2. Longer lasting tires
3. Smoother drive
4. Keep your wheels pointed in the right direction
5. Requires less energy to keep going hence saving fuel

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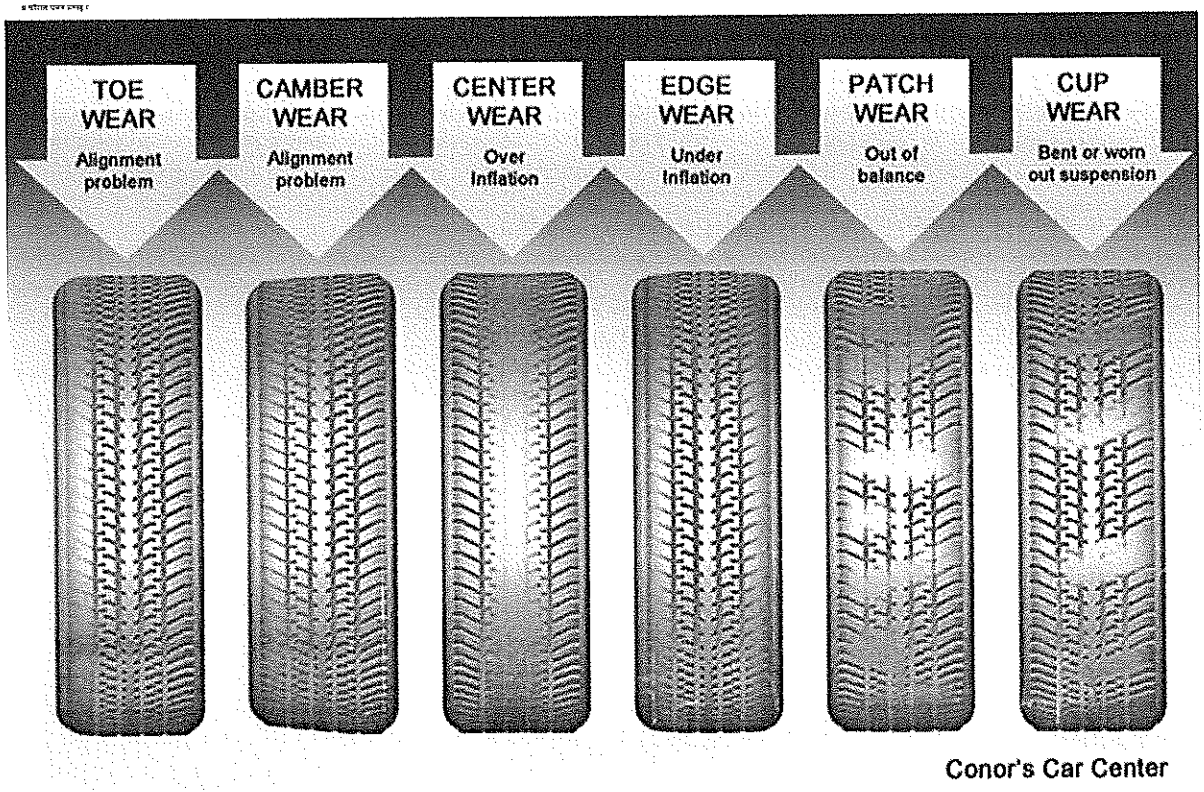
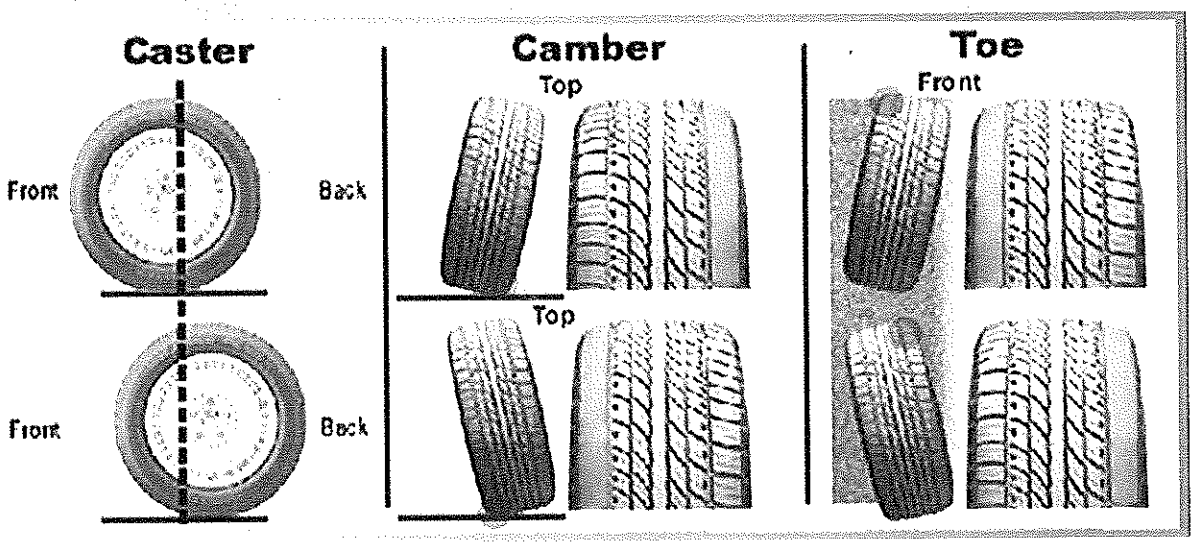




the relationship between alignment and tire wear?

Ideally, tires should wear evenly across the thread. Poor alignment causes uneven wear and can shorten a tire's life by thousands of kilometers. Crucial steering and suspension parts might be affected as well. To minimize the frequency of tire change and better fuel efficiency, have your wheel alignment checked.

you get your alignment checked

We recommend an alignment check with every other oil change. A lot happens over the course of 10,000 km. With the vast amount of potholes on the road in Massachusetts, your alignment would be thrown off even faster. The longer you wait for an alignment; the more damages will occur.

vehicles have different types of alignment specifications

Different car models have different alignment specifications which are determined by the manufacturers. We use a special computerized alignment machine that is pre-loaded with every vehicle's alignment specifications. Once the vehicle type is determined, the high tech and precise measuring begins.

it so hard to determine if the alignment is off

We cannot view a misalignment purely by the naked eye. With technology, we are able to diagnose the symptoms and signs of a misalignment which will have a huge impact on tire life.

Symptoms of misalignment

However, there are some noticeable signs of misalignment:

1. Vehicle pulling to the left or right
2. Uneven or rapid tyre wear
3. Steering is crooked when driving straight

Capability of the wheel alignment machine

1. Measure and set all 4 tyres to the settings of the manufacturer
2. Provide the most accurate reading available
3. Settings of all vehicles are pre-loaded in the system

Process of wheel alignment

1. Inspect steering and suspension system, including tyre condition and air pressure
2. Place vehicle on alignment rack, mount and calibrate sensors
3. Print out initial alignment settings
4. Adjust camber, caster & toe angles
5. Print out final alignment readings
6. Road test vehicles to make sure alignment is not off

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 1st Semester

End Sem. Examination

Course Code: AUT1103 **Time: 2 Hours**

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

Instruction:

1. Attempt all questions.
2. Use of Calculators is prohibited.
3. Section A contains 10 Questions. Each question carries 1 Marks.
4. Section B contains 4 Questions. Each question carries 4 Marks.
5. Section C contains 4 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

Q1. Plasma is a state of matter consisting of..... gas.

a) Hydrogen c) Nitrogen

b) Carbon dioxide d) Ionized

Q2. The dent which can be removed without any damage of vehicles paints are known as...

a) Ding c) Scratch

b) Extreme Dent d) Creased Dent

Q3. How many panels are there in a car body?

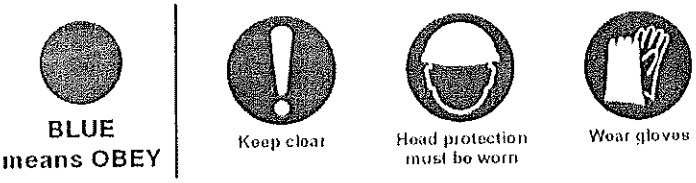
a) 13

b) 15

c) 06

d) 12

Q4. What BLUE colour shows in a safety sign?



a) Warning

b) Mandatory

c) Safe condition

d) Prohibition

Q5. Punching a numbers of holes in a sheet is known as.....

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

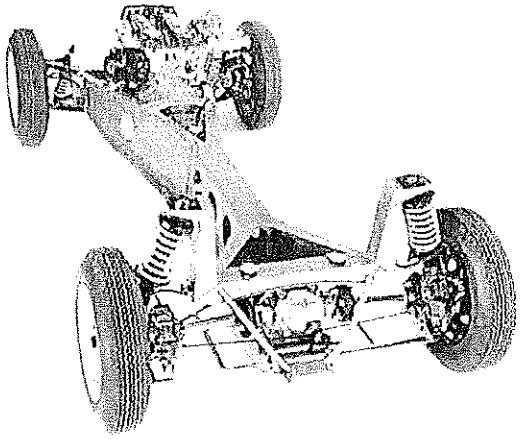
Q6. Process of removing the pieces from the edges in a sheet is known as.....

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

Q7. For GMAW welding..... electrode is used.

a) Consumable
b) Non-consumable
c) filler
d) None of the above

Q8. Name the type of chassis.



a) Monocoque
b) Ladder
c) Backbone
d) None of the above

Q9. For GTAW welding..... electrode is used.

a) Consumable
b) Non-consumable
c) filler
d) None of the above

Q10. Front - section of a car body also called

a) Doghouse
b) Cathouse
c) Greenhouse
d) None of the above

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Section – B

04X04 = 16 Marks

Q11. What are the characteristics of electrode coating?

Q12. Name tools and safety equipment's used in automotive body repair

Q13. Write short note Car body pillars

Q14. What are the different types of weld joint?

Section – C

04X06 = 24 Marks

Q15. Discuss Sheet Metal shearing process.

Q16. Describe the MIG/MAG welding.

Q17. Specify different types of car bodies with example.

Q18. Describe the types of Dent & its removal process.

As, Set A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 1st Semester

Answer sheet (Set A) End Sem. Examination

Course Code: AUT1103 Time: 2 Hours

Course Name: Automotive Body Repair Max. Marks: 50

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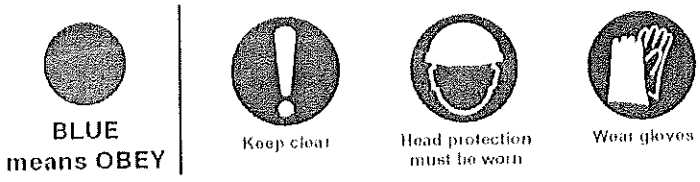

a) Warning
b) Mandatory
c) Safe condition
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a) Blanking
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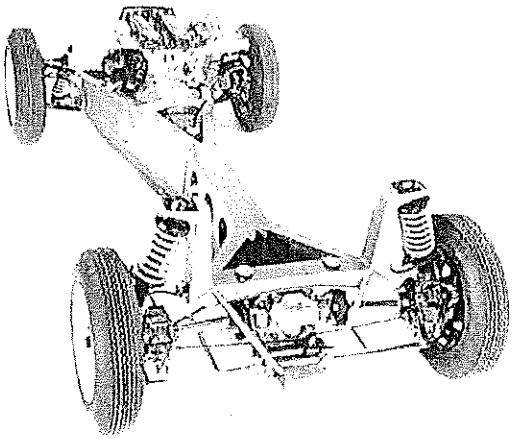

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d) None of the above

Q10. Front - section of a car body also called

a) **Doghouse**
b) Cathouse
c) Greenhouse
d) None of the above

Section – B

04X04 = 16 Marks

Q11. 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.

Q12. Name tools and safety equipment's used in automotive body repair

Ans.

The following tools and equipment are used in Body Repair Shop:

- Pneumatic tools
- Dent puller
- Grinder
- Metal-cutting guns
- Plasma cutters
- Heavy-duty hydraulic jacks
- Hammers & Mallet
- Files, pliers, wrenches, and screwdrivers.

The major safety equipments are;

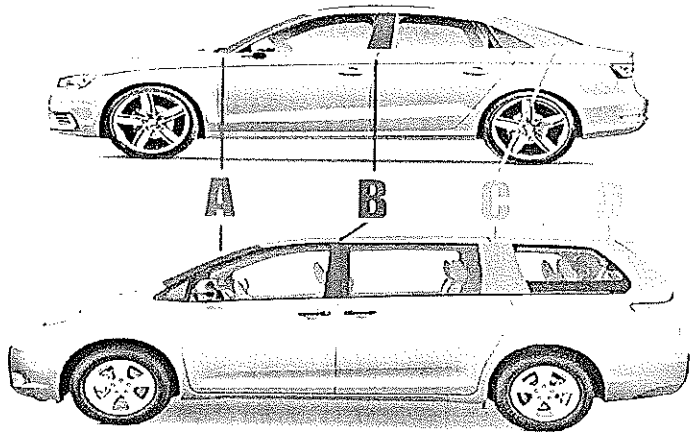
- Helmet
- Safety goggles
- Safety shoes
- Nose masks
- Gloves
- Ear plug(while grinding)

Q13. Write short note Car body pillars

Ans. Car Body pillar

Just like in civil construction, a car's pillars support its roof. To identify them, one needs to look at the car from one of its sides. The sloping pillar between which the windshield glass is fixed is the A Pillar. The second pillar from the front is the B Pillar, onto which the front doors click shut. The rear doors are hinged to the B Pillar as well. The C Pillar is behind the rear seat, and is the third and final pillar when it comes to hatchbacks, sedans, and small SUV's. Larger cars with a third row of seating, like Minivans and Large SUV's, have a fourth D Pillar, which is behind the third row.

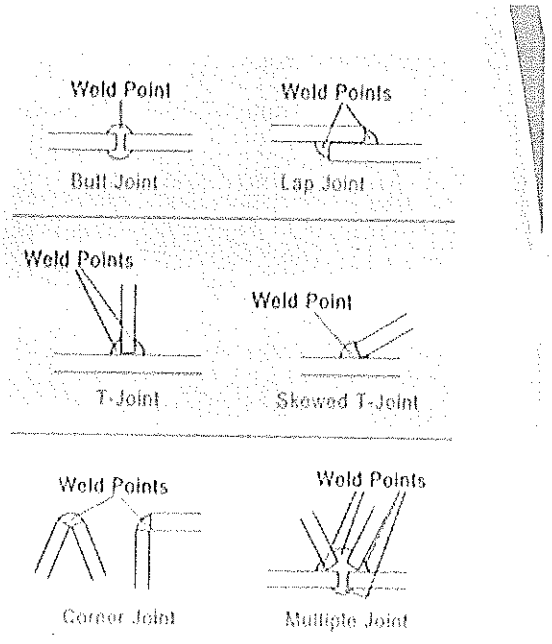
Typically, thicker A and C Pillars (D, in case of Minivans and SUV's) are disliked as they block the driver's field of vision at the front and back respectively.



Q14. What are the different types of weld joint?

Ans.

- The area in which the work pieces are welded together is referred to as a joint.
- Depending on the position of the parts relative to one other, weld joint are identified as:
  - Butt joint
  - Lap joint
  - T-Joint
  - Skewed T-Joint
  - Corner Joint
  - Multiple Joint



Section – C

04X06 = 24 Marks

Q15. Discuss Sheet Metal shearing process.

Ans. **Shearing processes** -- processes which apply shearing forces to cut, fracture, or separate the material.

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

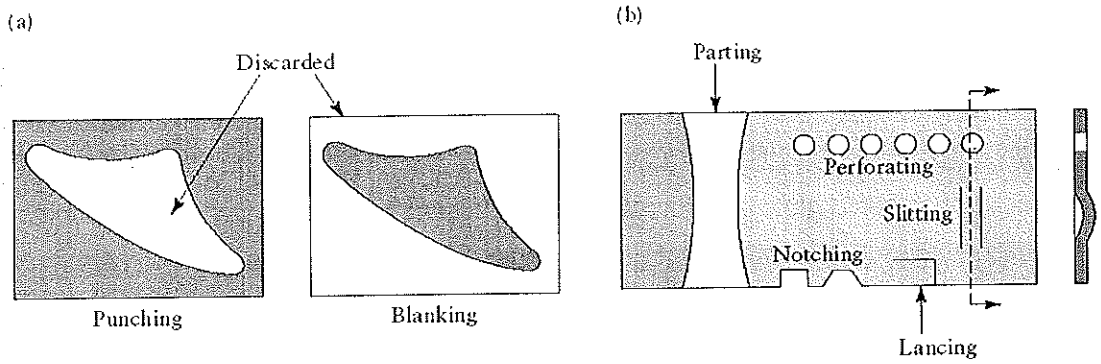


Fig.1Shearing Operations: Punching, Blanking and Perforating

Q16. Describe the MIG/MAG welding.

Ans.

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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.

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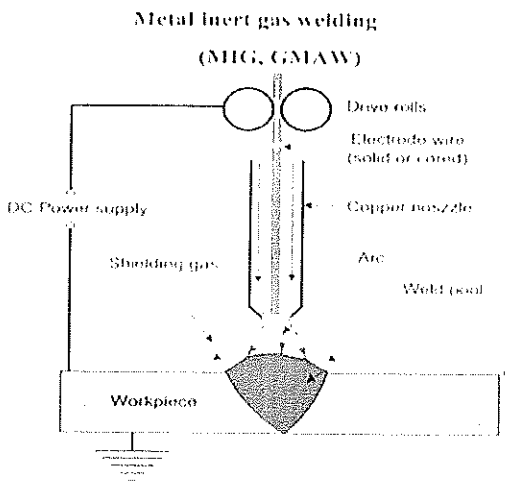
Long and short arc are used during MAG welding.

MAG welding is a steel welding process.



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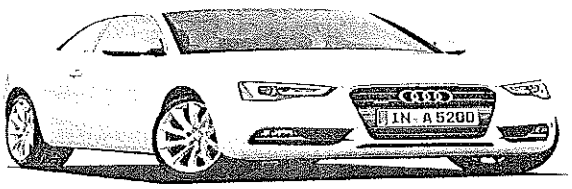
Coupes are often the sporty variants of saloon cars, with doors reduced from 4 to 2. However, the coupe body style varies from carmaker to carmaker, and now there are even four-door coupes like the Mercedes-Benz CLS-Class. The name 'coupe' comes from the French verb 'Couper', which means 'to cut'. An example of a two-door coupe is the Audi A5.



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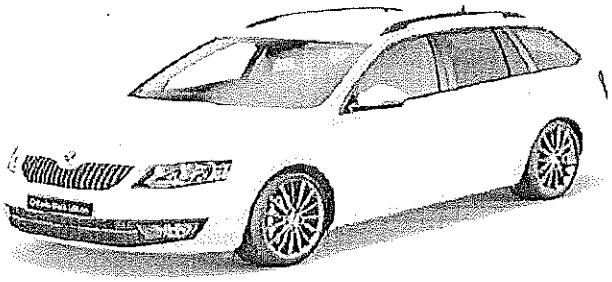

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A crossover is a vehicle built on a car platform but often with features of an SUV like increased ground clearance and a higher seating position. Crossovers are typically designed only for light off-roading. An example of a crossover is the recently-launched Fiat Avventura.

Pickup

A pickup is a light motor vehicle with an open rear cargo area known as a 'bed'. These are extremely popular in the US, and feature factory-built integrated beds. The term also applies to coupe utility vehicles, where they are based on a car chassis or a dedicated platform. Pickups are called 'utes' in Australia and New Zealand. They are often available with two or four doors for the passenger compartment, and are called single-cab pickups and double-cab pickups respectively. An example of a pickup is the Tata Xenon, which features a double-cab design.

Q18. Describe the types of Dent & its removal process.

Ans.

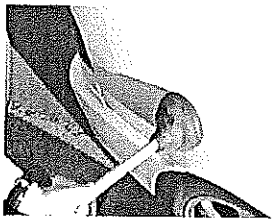
Types of Dents

- Car Dings – caused by smaller objects and are easy to repair as long as no damage to the vehicles paint has occurred.
- Round Dents – caused from hailstones or a similarly round object (football, baseball, basketball, etc.) hitting the car and causing a dimple on the door, bumper, roof or hood.
- Crease Type Dents – Crease dents usually bends and tears the car's metal. When an automobile acquires a crease type dent, it is possible to lose the metal memory making it hard to repair back to original shape.

Paintless Dent Removal

Household Plunger

- The removal of basic car dents can be done with the help of a regular plunger with the right technique.
- The method is easier to complete when there are large dents without any holes or creases.



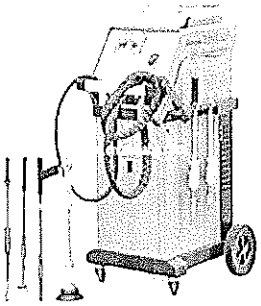
Paintless Dent Removal

Car Dent Plunger

There is a wide range of plungers and pullers available at car part stores that are specially designed for car dent removal.

Dent Puller

- Dent puller is a machine which is used to remove dent by the application of spot weld.

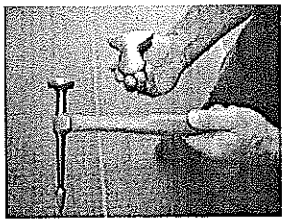


Mallet

- In the cases where you access to the back of the body part that has suffered the dent, a rubber mallet can be used for the car dent removal.
- If the dents are in a large area, like the hood of the car, you may carefully use the mallet on the reverse side to bring the bodywork back into its place.

Hammer

- A standard metal work hammer can also be used as a technique for car dent removal
- This method is particularly effective for small and uneven dents.



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.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 1st Semester

Answer sheet (Set B) End Sem. Examination

Course Code: AUT1103 **Time: 2 Hours**

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

Instruction:

1. Attempt all questions.
2. Use of Calculators is prohibited.
3. Section A contains 10 Questions. Each question carries 1 Marks.
4. Section B contains 4 Questions. Each question carries 4 Marks.
5. Section C contains 4 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

Q1. A structure design in which the frame and body are built as a single integrated structure is called.....

a) Backbone c) **Monocoque**

b) Ladder d) All of the above

Q2. The gap between the electrode rod and the work piece should be about .....

a) The electrode diameter c) 5 mm

b) The work piece thickness d) **the core wire diameter**

Q3. Plasma is a state of matter consisting of..... gas.

a) Hydrogen c) Nitrogen

c) Carbon dioxide d) **Ionized**

Q4. Punching a numbers of holes in a sheet is known as.....

a) Blanking c) **Perforating**

c) Slitting d) Drawing

Q5. Process of removing pieces from the edges in a sheet is known as.....

a) Blanking c) Perforating

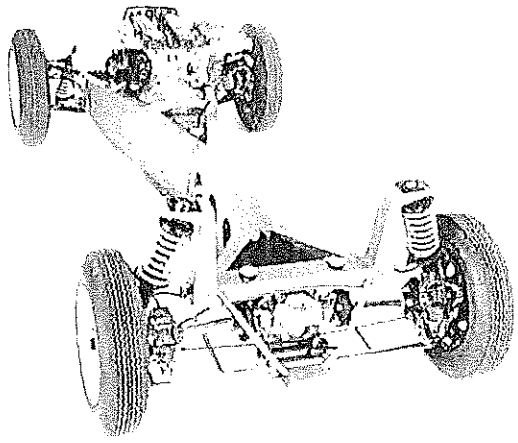
c) Slitting d) **Notching**

Q6. For GMAW welding..... electrode is used.

a) **Consumable** c) filler

b) Non-consumable d) None of the above

Q7. Name the type of chassis.



a) Monocoque

b) Ladder

c) Backbone

d) None of the above

Q8. Front - section of a car body also called

a) Doghouse

b) Cathouse

c) Greenhouse

d) None of the above

Q9. The dent which can be removed without any damage of vehicles paints are known as...

a) **Ding** c) Scratch

b) Extreme Dent d) Creased Dent

Q10. How many panels are there in a car body?

a) 13

b) 15

c) 06

d) 12

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Section – B

04X04 = 16 Marks

Q11. What are the advantages and disadvantages of manual metal arc welding?

Ans:

Advantages

i. Simple welding equipment
ii. Portable- easy to transport
iii. Works on dirty metal
iv. Inexpensive power source
v. Relatively inexpensive equipment
vi. Welders use standard domestic current.
vii. Big range of metals and alloys can be welded.
viii. Used for maintenance, repair, and field construction

Disadvantages

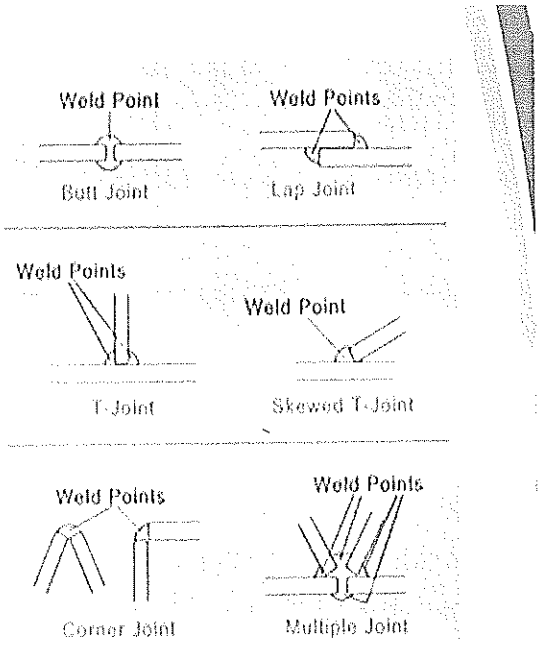
i. Not clean enough for reactive metals such as aluminium and titanium.
ii. The deposition rate is limited because the electrode covering.
iii. Relatively high metal wastage (electrode stubs)

The electrode length is ~ 35 mm and requires electrode changing lower the overall production rate.

Q12. What are the different types of weld joint?

Ans.

- The area in which the work pieces are welded together is referred to as a joint.
- Depending on the position of the parts relative to one other, weld joint are identified as:
  - Butt joint
  - Lap joint
  - T-Joint
  - Skewed T-Joint
  - Corner Joint
  - Multiple Joint



Q13. What are the characteristics of electrode coating?

Ans:

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.

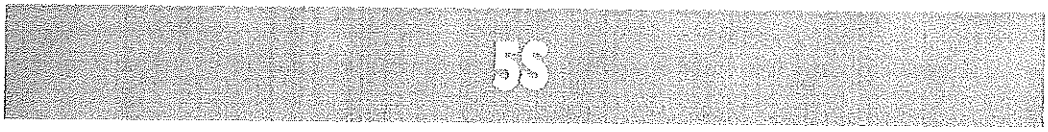
vii. Affect arc penetration (the depth of melting in the work piece).

viii. Influence the shape of the weld bead.

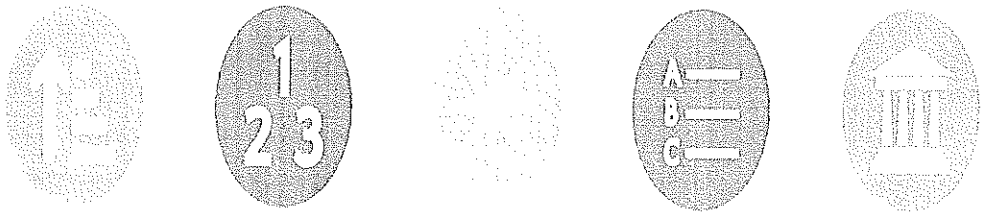
ix. Add additional filler metal.

Q14. Explain 5S technique

Ans.



5S is a five-step organization technique to create and maintain an intuitive workspace.



Sort	Set In Order	Shine	Standardize	Sustain
Keep only necessary items in the workplace.	Arrange items to promote efficient workflow.	Clean the work area so it is neat and tidy.	Set standards for a consistently organized workplace.	Maintain and review standards.

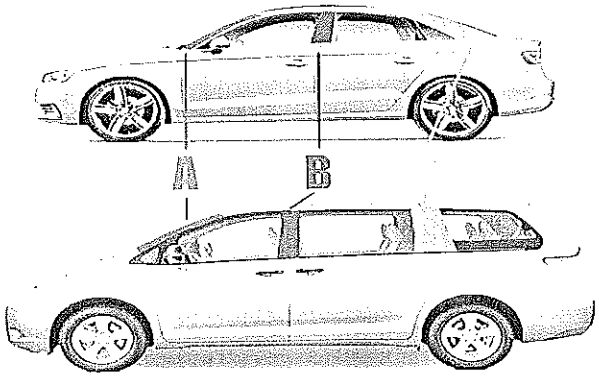
Section – C

04X06 = 24 Marks

Q15. Write note on Car body pillars

Ans. **Car Body pillar**

Just like in civil construction, a car's pillars support its roof. To identify them, one needs to look at the car from one of its sides. The sloping pillar between which the windshield glass is fixed is the A Pillar. The second pillar from the front is the B Pillar, onto which the front doors click shut. The rear doors are hinged to the B Pillar as well. The C Pillar is behind the rear seat, and is the third and final pillar when it comes to hatchbacks, sedans, and small SUV's. Larger cars with a third row of seating, like Minivans and Large SUV's, have a fourth D Pillar, which is behind the third row.Typically, thicker A and C Pillars (D, in case of Minivans and SUV's) are disliked as they block the driver's field of vision at the front and back respectively.



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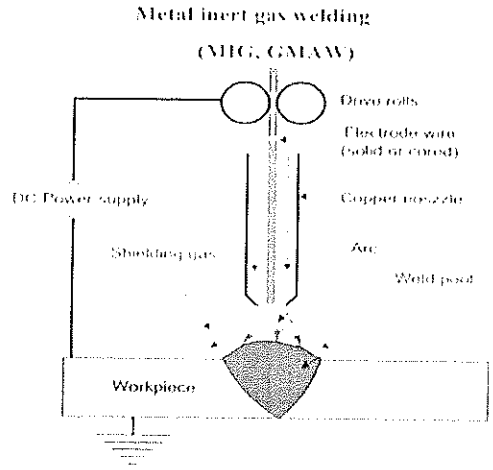

Q17. Name tools and safety equipment's used in automotive body repair

Ans. The following tools and equipment are used in Body Repair Shop:

- Pneumatic tools
- Dent puller
- Grinder
- Metal-cutting guns
- Plasma cutters
- Heavy-duty hydraulic jacks
- Hammers & Mallet
- Files, pliers, wrenches, and screwdrivers.

  The major safety equipment's are;
- Helmet, Safety goggles, Safety shoes, Nose masks, Gloves, Ear plug(while grinding).

Q18. Specify different types of car bodies with example.

Ans. **Hatchback**

A hatchback is a car with a sloping back and a hinged rear door that opens upwards. These cars differ from SUVs, MPVs or vans in that they are usually much more compact. Hatchbacks usually have seating for four-five people is almost always a tight squeeze. An example of a hatchback is the Maruti Suzuki Swift.

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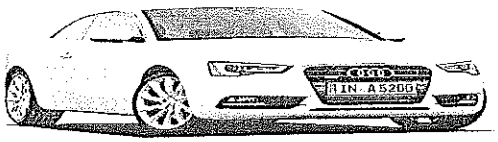

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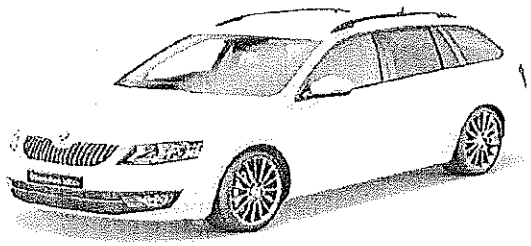

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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Set (A)

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 1st Semester,

End-Sem. Examination

Course Code: AUT1104 **Time: 2 Hours**

Course Name: Automotive Spray Painting

Max. Marks: 50

Instruction:

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

Section – A

10X01 = 10 Marks

1. Which substance acts as a bonding agent in the painting of a body panel in Automotive Workshop?

a. Primer.
b. Putty.
c. Hardener.
d. None of the above.

2. Which place is used to mix the paint elements in an automotive workshop?

a. Inside the paint booth.
b. Inside paint mixing room.
c. Outside paint mixing room or paint booth.
d. None of the above.

3. Which of the recommended workplace is used to apply re-finish paint on a raw panel in a workshop?

a. Sanding Room.
b. Paint Mixing Room.
c. Paint Booth.
d. All of the above.

4. Why do we need to sand a panel for standard preparation in paint shop?

a. To fill up the holes left while putty application.
b. To even the surface of the panel.
c. Both a & b.
d. None of the above.

5. Which of these substance is used to bind the pigments in preparation of base coat?

a. Activator.
b. Binder.
c. Thinner.
d. Hardener.

6. What should be the distance between HVLP spray gun and panel during painting?
   a. 6-8 inches.
   b. 1-3 inches.
   c. 12-15 inches.
   d. None of the above.
7. The air pressure of the HVLP spray gun should be.....
   a. 2-3 bar.
   b. 3-4 bar.
   c. 4-5 bar.
   d. 5-6 bar.
8. Which one of the following automotive painting is also known as 3-stage painting?
   a. Solid Painting.
   b. Metallic Painting.
   c. Pearlescent Painting.
   d. None of the above.
9. The clear coat is used for.....
   a. Protection of paint.
   b. Gloss for paint.
   c. Both a & b.
   d. None of the above.
10. The size of nozzle tip for primer application is.....
   a. 1.8 mm.
   b. 1.3 mm.
   c. 0.8 mm.
   d. 1.4 mm.

Section – B

04X04 = 16 Marks

11. What are the responsibilities of a paint shop technician?
12. Write short notes on paint mixing room.
13. What do you understand by the term Putty? Write down the different types of putty used in an automotive workshop.
14. What do you understand by the term Sanding a panel in paint shop?

Section – C

04X06 = 24 Marks

15. What do you understand by primer? Explain different properties of primer.
16. What is Infrared drying? What are the advantages of infrared drying?
17. What is the use of dry guide coat during dry sanding?
18. What is a spray gun? Explain different types of spray guns with their applications.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Set(A)

School of Automotive Skills

Session 2021-22, Summer Semester

B. Voc. Program, 1st Semester,

End-Sem. Examination

Course Code: AUT1104

Course Name: Automotive Spray Painting

Section – A

10X01 = 10 Marks

1. Which substance acts as a bonding agent in the painting of a body panel in Automotive Workshop?

Answer: a. Primer.

2. Which place is used to mix the paint elements in an automotive workshop?

Answer: b. Inside paint mixing room.

3. Which of the recommended workplace is used to apply re-finish paint on a raw panel in a workshop?

Answer: c. Paint Booth.

4. Why do we need to sand a panel for standard preparation in paint shop?

Answer: c. Both a & b.

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Answer: b. Binder.

6. What should be the distance between HVLP spray gun and panel during painting?

Answer: a. 6-8 inches.

7. The air pressure of the HVLP spray gun should be.....

Answer: a. 2-3 bar.

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Answer: c. Pearlescent Painting.

9. The clear coat is used for.....

Answer: c. Both a & b.

10. The size of nozzle tip for primer application is……..

Answer: a. 1.8 mm.

Section – B

04X04 = 16 Marks

11. What are the responsibilities of a paint shop technician?

Answer: To carry all types of vehicle body refinishing works like:

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

- To identify and utilise the correct methods of working by using your experience, skills, training and industry knowledge.
- To keep your skills up-to-date by making appropriate efforts to acquire adequate knowledge of new vehicles.
- To identify and report all apparent faults considered to be advisable in the interest of safety and reliability.

12. Write short notes on paint mixing room.

Answer: Paint mixing room:

- Paint mixing room is a place where we mix 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 paint mixing room:

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

13. What do you understand by the term Putty? Write down the different types of putty used in an automotive workshop.

Answer: Putty is a material with high plasticity, similar in texture to clay. Painter's Putty is typically used for filling holes, minor cracks, scratches etc.

There are three types of putty fillers:

1. Standard.
2. Mid-Range.
3. Premium.

14. What do you understand by the term Sanding a panel in paint shop?

Answer: Sanding removes the top layer of your car's paint using abrasive materials. It also helps to make the surface even after the putty application by removing extra putty from the surface.

Function of sanding in car repairing:

- Removal of material.
- Preparation of surfaces (adhesion promoter).
- Smoothing and surface embellishment.
- Reparation of defects.

Types of sanding:

1. Manual sanding.
    a. Wet sanding.
    b. Dry sanding.
2. Automatic sanding.

Section – C

04X06 = 24 Marks

15. What do you understand by primer? Explain different properties of primer.

Answer: 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-k primers.
- 2-k primers.

Properties of Primer:

- 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.

16. What is Infrared drying? What are the advantages of infrared drying?

Answer: Infrared drying:

- It involves 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 of Infrared Drying:

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

17. What is the use of dry guide coat during dry sanding?

Answer:

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 unwanted material to even the surface as required to suit the body line and curves of the panel during dry sanding.

18. What is a spray gun? Explain different types of spray guns with their applications.

Answer:

The spray gun is the most popular type of spray application equipment used in re-finish painting. A 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.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 1st Semester,

End-Sem. Examination

Course Code: AUT1104 **Time: 2 Hours**

Course Name: Automotive Spray Painting

Max. Marks: 50

Instruction:

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

Section – A

10X01 = 10 Marks

1. Which one of the following elements enhances the properties of paint?
   a. Additives.
   b. Solvents.
   c. Hardeners.
   d. Binders.
2. 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 the above.
3. Which one of the sanding processes promotes the corrosion?
   a. Wet Sanding.
   b. Dry Sanding.
   c. Both a & b.
   d. None of the above.
4. The size of nozzle tip for clear coat application is……
   a. 1.8 mm.
   b. 0.8 mm.
   c. 1.2 mm.
   d. 1.4 mm.
5. Which one of the following elements of paint provides the paint its colour?
   a. Additives.
   b. Binder.
   c. Pigment.
   d. Solvent.
6. The paint defect occurred due to wrong sanding is…
   a. Sanding Scratches.
   b. Orange Peel.
   c. Water Spotting.
   d. All of the above.
7. The shape of the spray should be…,……in shape.
   a. Circular.
   b. Oval.
   c. Triangular.
   d. All of the above.

8. Which one of the following automotive paintings is also known as 2-stage painting?
   a. Solid Painting.
   b. Metallic Painting.
   c. Pearlescent Painting.
   d. None of the above.
9. Infrared dryer works on the principle of……
   a. Conduction.
   b. Convection.
   c. Radiation.
   d. All of the above.
10. The equipment used to remove the extra putty from the surface is……
   a. Putty spreader sheet.
   b. Dry sander.
   c. Spray gun.
   d. None of the above.

Section – B

04X04 = 16 Marks

11. Write any four equipment used in paint shop.
12. What are the five consumables used in paint shop?
13. What do you understand by the term Primer? Write down the different types of primer used in an automotive workshop.
14. What do you understand by the term paint defects?

Section – C

04X06 = 24 Marks

15. Define paint. What are the different elements of paints?
16. What is a spray gun? Explain different types of spray guns with their applications.
17. Write roles and responsibilities of a paint shop technician.
18. Explain the term DFT (Dry Film Thickness) in detail.

Vipin

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session 2021-22, Summer Semester

B. Voc. Program, 1st Semester,

End-Sem. Examination

Course Code: AUT1104

Course Name: Automotive Spray Painting

Section – A

10X01 = 10 Marks

1. Which one of the following elements enhances the properties of paint?

Answer: a. Additives.

2. DFT (Dry Film Thickness) is an instrument which is used to measure……

Answer: a. Thickness of coating.

3. Which one of the sanding processes promotes the corrosion?

Answer: a. Wet Sanding.

4. The size of nozzle tip for clear coat application is……

Answer: c. 1.2 mm.

5. Which one of the following elements of paint provides the paint its colour?

Answer: c. Pigment.

6. The paint defect occurred due to wrong sanding is…

Answer: a. Sanding Scratches.

7. The shape of the spray should be…,……in shape.

Answer: b. Oval.

8. Which one of the following automotive paintings is also known as 2-stage painting?

Answer: b. Metallic Painting.

9. Infrared dryer works on the principle of……

Answer: c. Radiation.

10. The equipment used to remove the extra putty from the surface is……

Answer: b. Dry Sander.

Section – B

04X04 = 16 Marks

11. Write any four equipment used in paint shop.

Answer:

1. Paint Booth.
2. Infrared Dryer.
3. Spray Gun.
4. Dry Sander.

12. What are the five consumables used in paint shop?

Answer:

1. Paint Thinner.
2. Surgical Gloves.
3. Wiping clothes.
4. Sanding papers.
5. Masking paper.

13. What do you understand by the term Primer? Write down the different types of primer used in an automotive workshop.

Answer: 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-k primers.
- 2-k primers.

Properties of Primer:

- 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.

14. What do you understand by the term paint defects?

Answer: Painting not only gives a good appearance to a structure but also provides protection against various infiltrative actions such as corrosion, decaying, weathering, etc. But however, paint film also gets deteriorated by these actions. Hence the paint should be selected based on many factors such as type of surface, type of environment, etc. Otherwise, defects may occur in painting.

Following are the common defects that occur in painting:

- Blistering and Peeling.
- Fading.
- Grinning.
- Chalking.
- Running.
- Sagging.
- Flaking.
- Blooming.
- Wrinkling.
- Flashing.
- Saponification.
- Alligatoring.
- Checking.
- Mildew.

Section – C

04X06 = 24 Marks

15. Define paint. What are the different elements of paints?

Answer: Automotive paint is paint used on automobiles for both protection and decoration purposes. Water-based acrylic polyurethane enamel paint is currently the most widely used paint for reasons including reducing paint's environmental impact.

Modern automobile paint is applied in several layers, with a total thickness of around 100 µm (0.1mm). Paint application requires preparation and primer steps to ensure proper application. A basecoat is applied after the primer paint is applied. Following this, a clear coat of paint may be applied that forms a glossy and transparent coating. The clear coat layer must be able to withstand UV light.

Elements of paints are:

1. Binders.
2. Pigments.
3. Additives.
4. Hardener.
5. Solvent.

16. What is a spray gun? Explain different types of spray guns with their applications.

Answer: The spray gun is the most popular type of spray application equipment used in re-finish painting. A 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.
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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.

17. Write roles and responsibilities of a paint shop technician.

Answer:

To carry all types of vehicle body refinishing works like:

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

- To identify and utilise the correct methods of working by using your experience, skills, training and industry knowledge.
- To keep your skills up-to-date by making appropriate efforts to acquire adequate knowledge of new vehicles.

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

18. Explain the term DFT (Dry Film Thickness) in detail.

Answer: Dry film thickness (DFT) is the thickness of a coating as measured above the substrate. This can consist of a single layer or multiple layers. DFT is measured for cured coatings (after the coating dries). The thickness of a coating depends on the application and type of process employed. Proper thickness should be determined by recommended coating system parameters.

- A coating is the most critical component in an anticorrosive coating system. The main function of a coating is to provide corrosion protection by adhesion to the substrate. It is critical that the applied thickness be sufficient to ensure corrosion protection as well as proper adhesion.
- Film thickness is measured to ensure its compliance with ASTM, ISO and other specifications. There are coating inspection tools that are used at every stage of the coating process to ensure DFT meets correct specifications.

Types of DFT gauges include:

1. Magnetic pull-off (Type I).
2. Constant pressure probe (Type II).
3. Electronic magnetic flux.
4. Eddy current gauge.

The standards concerning DFT measurements include:

- ISO 2808
- BS 3900 Part C5
- BS 5494
- ASTM D1005
- D1400
- D2691
- SIS 184160

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 1st Semester,

End-Sem. Examination

Course Code: AUT1105 **Time: 2 Hours**

Course Name: Automotive Electrical Fundamentals and Air Conditioning

Max. Marks: 50

Instruction:

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

Section – A

10X01 = 10 Marks

1. What type of specification is used to rate a transducer?
   a. Transmitting Range.
   b. Receiving Range.
   c. Dynamic Range.
   d. All of the above.
2. TCP is a type of an actuator. What does TCP stand for?
   a. Torqued and coiled polymer.
   b. Twisted and coaxial polymer.
   c. Twisted and coiled polymer.
   d. None of the above.
3. Which of the term in the following is not a property of refrigerant R134a?
   a. High heat of vaporization.
   b. Flammable.
   c. Non-corrosive.
   d. Non-toxic.
4. If in a circuit there are three resistors each of 120 ohms connected as two in series and one in parallel with those two, & with a battery of 12 V. Then find out the total current of the circuit?
   a. 15A.
   b. 1.5A.
   c. 115A.
   d. 0.15A
5. What is the effect of voltage to current in a circuit?
   a. Voltage increase while current increase.
   b. Voltage decrease while current increase.
   c. Voltage increase while current decrease.
   d. None of the above.
6. Who invented the voltaic pile?
   a. Alexander Graham Bell.
   b. Alessandro Volta.
   c. Albert Einstein.
   d. A.P.J. Abdul Kalam.

7. What is the universally accepted cylinder code for R134a?
   a. Light Green.
   b. Light Yellow.
   c. Light Red.
   d. Light Blue.
8. A parking light takes 0.5A current, its resistance is 24 Ω. What is the voltage of the lamp?
   a. 12 Volts.
   b. 24 Volts.
   c. 10 Volts.
   d. 48 Volts.
9. Which of the following is not an application of an actuator?
   a. Electroactive Polymer.
   b. Electropassive Polymer.
   c. Thermal Bimorph.
   d. Shape-memory Alloy.
10. The function of a compressor is to remove the vapor produced by the ..... and to deliver it at a required ..... pressure.
   a. Evaporator, Lower.
   b. Evaporator, Higher.
   c. Expansion Valve, Lower.
   d. Expansion Valve, Higher.

Section – B

04X04 = 16 Marks

11. Define the following:
   a. Coefficient of performance.
   b. Heat Engine.
   c. Heat Pump.
   d. Refrigerator.
12. Name any eight sensors with their function used in an automotive vehicle.
13. Write down the advantages and disadvantages of VCRS over Air Refrigeration System.
14. Explain different types of Thermodynamic Systems.

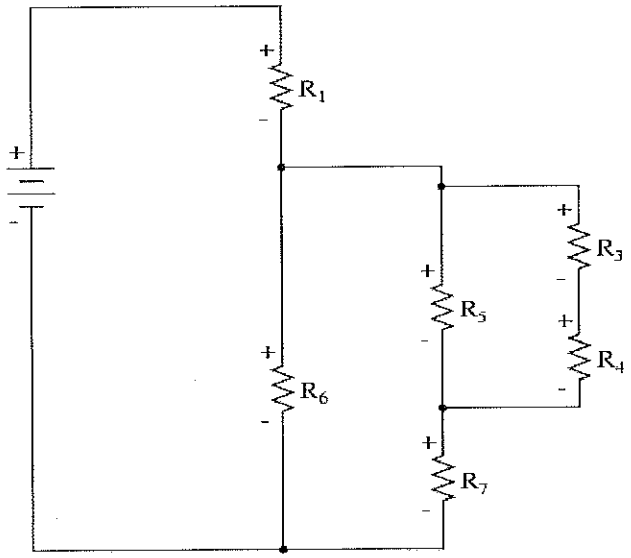
Section – C

04X06 = 24 Marks

15. Write down the standard operating procedure of AC Gas Recycling through Bosch Robinair ACS 261.
16. Explain the following:
   a. Electrostatic Effect.
   b. Multimeter.
   c. Relay.
17. Define AC Compressor, Condenser & Evaporator in detail.

18. Solve the mixed-circuit wiring diagram, and find out the following quantities as given below:
    a. Total Resistance.
    b. Total Current.

    (Given: R1 = 100 ohms, R2 = 120 ohms, R3 = 115 ohms, R4 = 200 ohms, R5 = 100 ohms, R6 = 30 ohms & R7 = 150 ohms, Voltage of the battery is 24 Volts)



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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session 2021-22, Summer Semester

B. Voc. Program, 1st Semester,

End-Sem. Examination

Course Code: AUT1105

Course Name: Automotive Electrical Fundamentals & Air Conditioning

Section – A

10X01 = 10 Marks

1. What type of specification is used to rate a transducer?

Answer: c. Dynamic Range.

2. TCP is a type of an actuator. What does TCP stand for?

Answer: c. Twisted and coiled polymer.

3. Which of the term in the following is not a property of refrigerant R134a?

Answer: b. Flammable.

4. If in a circuit there are three resistors each of 120 ohms connected as two in series and one in parallel with those two, & with a battery of 12 V. Then find out the total current of the circuit?

Answer: d. 0.15A.

5. What is the effect of voltage to current in a circuit?

Answer: a. Voltage increase while current increases.

6. Who invented the voltaic pile?

Answer: b. Alessandro Volta.

7. What is the universally accepted cylinder code for R134a?

Answer: d. Light Blue.

8. A parking light takes 0.5A current, its resistance is 24 Ω. What is the voltage of the lamp?

Answer: a. 12 Volts.

9. Which of the following is not an application of an actuator?

Answer: b. Electropassive Polymer.

10. The function of a compressor is to remove the vapour produced by the ..... and to deliver it at a required ..... pressure.

Answer: b. Evaporator, Higher.

Section – B

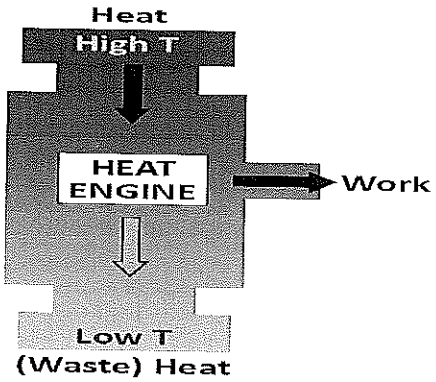
04X04 = 16 Marks

11. Define the following:
    a. Coefficient of performance.
    b. Heat Engine.
    c. Heat Pump.
    d. Refrigerator.

Answer:

a. A refrigeration system's coefficient of performance (CoP) is very important in determining a system's overall efficiency. It is defined as refrigeration capacity in kW divided by the energy input in kW. While CoP is a very simple measure of performance, it is typically not used for industrial refrigeration in North America. Owners and manufacturers of these systems typically use performance factor (PF).

b. In thermodynamics and engineering, a heat engine is a system that converts heat or thermal energy—and chemical energy—to mechanical energy, which can then be used to do mechanical work. It does this by bringing a working substance from a higher state temperature to a lower state temperature.



c. A heat pump is a device that transfers heat energy from a source of heat to what is called a thermal reservoir. Heat pumps move thermal energy in the opposite direction of spontaneous heat transfer, by absorbing heat from a cold space and releasing it to a warmer one.

d. A refrigerator (colloquially fridge) consists of a thermally insulated compartment and a heat pump (mechanical, electronic or chemical) that transfers heat from the inside of the fridge to its external environment so that the inside of the fridge is cooled to a temperature below the room temperature. Refrigeration is an essential food storage technique in developed countries.

12. Name any eight sensors with their function used in an automotive vehicle.

Answer:

1. Crankshaft Position Sensor: The functional objective for the crankshaft position sensor is to determine the position and/or rotational speed (RPM) of the crank. Engine Control

Units use the information transmitted by the sensor to control parameters such as ignition timing and fuel injection timing.

2. Engine Coolant Temperature Sensor: Coolant temperature sensors are used by the fuel management system to detect the engine's operating temperature. Depending on the sensor information, the control unit adapts the injection time and firing angle to the operating conditions.
3. Airbag Sensor: This airbag works as an inflatable seatbelt that inflates upon frontal impact from another vehicle. Activation of automotive airbags is triggered by crash sensors (also known as impact sensors) that work to detect frontal impact and trigger a control unit that deploys the airbag to cushion the passenger.
4. Camshaft Position Sensor: The purpose of a camshaft position sensor is to determine the position of the camshaft as it relates to the crankshaft. This data is then sent to the powertrain control module (PCM) for use with fuel injector and/or ignition system control.
5. Brake Fluid Pressure Sensor: The sensor has an input port to measure the hydraulic braking pressure and an electrical connector output for a wire connection for feeding the warning light. Some brake failures do not trip the sensor into a fault mode. A brake fluid pressure sensor is used in anti-lock braking system (ABS).
6. Knock Sensor: The knock sensor is located on the engine block, cylinder head or intake manifold. This is because its function is to sense vibrations caused by engine knock or detonation. The PCM uses this signal to alter the ignition timing and prevent detonation. Be clear that this sensor affects the ignition timing of an engine.
7. MAP Sensor: The Manifold Absolute Pressure (MAP) sensor is a key sensor because it senses engine load. The sensor generates a signal that is proportional to the amount of vacuum in the intake manifold. The engine computer then uses this information to adjust ignition timing and fuel enrichment.
8. Oxygen Sensor: 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).

13. Write down the advantages and disadvantages of VCRS over Air Refrigeration System.

Answer:

Advantages:

- Size is small when compared to an air refrigeration system for a given capacity of refrigeration.
- Volume of refrigerant circulated is low. Hence the running cost is low.
- High coefficient of performance.
- The operating temperature range is huge.

- The temperature at the evaporator can be easily controlled by regulating expansion valve.
- It requires smaller evaporator.

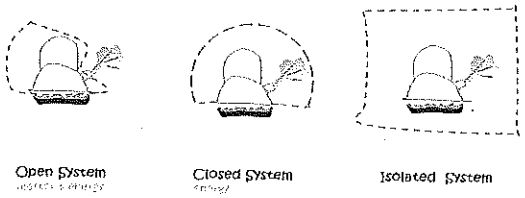
Disadvantages:

- High initial cost, costly refrigerant.
- Environmental hazardous refrigerant involved.
- Must ensure the prevention of leakage of refrigerant.

14. Explain different types of Thermodynamic Systems.

Answer:

- A thermodynamic system is a group of material and/or radiative contents. Its properties may be described by thermodynamic state variables such as temperature, entropy, internal energy, and pressure.
- The simplest state of a thermodynamic system is a state of thermodynamic equilibrium, as opposed to a non-equilibrium state. A system is defined as quantity of matter or a region in space chosen for study. Everything external to the system is surrounding. Thermodynamic system and surrounding is always separated by the boundary.



- The system can be separated from its surrounding by a wall or without a wall.
- When the state of its content varies in space, the system can be considered as many systems located next to each other, each being a different thermodynamical system.
- A thermodynamic system is subject to external interventions called thermodynamic operations; these alter the system's walls or its surroundings; as a result, the system undergoes thermodynamic processes according to the principles of thermodynamics. (This account mainly refers to the simplest kind of thermodynamic system; compositions of simple systems may also be considered.)

Section – C

04X06 = 24 Marks

15. Write down the standard operating procedure of AC Gas Recycling through Bosch Robinair ACS 261.

Answer:

- The student should wear appropriate PPE's like safety goggles, safety gloves, earplugs, nose mask, etc. while working on Robinair ACS 261 A/C recycling machine.
- Check the power supply of the machine, it should be three phase.

- Check the cooling effect of the vehicle by temperature measuring instrument.
- Check the unwanted sound of the compressor.
- Check the compressor oil level (Top-up if required).
- Check the refrigerant amount from the refrigerant tank (if less then fill it up).
- Check the connections of the A/C line.
- Turn ON the machine.
- Connect the high pressure and low pressure valves with hose reel connectors.
- Select A/C Servicing.
- Select Manual / Auto Mode of A/C recycling.
- Select Recovery of refrigerant (PI Time of 1 minute), then select vacuuming of A/C System Line (Vacuum. Creation time for 20 minutes and Vacuum. Holding time for 5 minutes), Oil recharging (10 ml or *as per cabin size and vehicle manual specifications), Refrigerant charging (300 gm to 900 gm as per mentioned in the manual as per cabin size), Hose pipe draining.

Process:

Step 1: Start recovery of refrigerant gas from the A/c System.

Step 2: After recovery start vacuum creation and vacuum holding in the line of A/C System.

Step 3: After step 2, start refilling of the compressor oil and refrigerant in the A/C System.

Step 4: After refilling, remove the hose connectors from the outlet valves, and start the hose draining process to ensure that no refrigerant gas should remain in the hose pipe of the Robinair ACS 261.

Step 5: Note down the summary screen of the Robinair ACS 261 for the final results of A/C Recycling in a vehicle to know the amount recovered and consumed & the time taken for the process to estimate the cost of job work.

Step 6: Switch OFF the machine and remove the power supply.

- Check the cooling effect of the vehicle by temperature measuring instrument after the process of recycling of refrigerant by turning ON the vehicle for 15 minutes.
- Check the workplace properly and manage it from the initial phase of the process for better working of the job.

16. Explain the following:
    a. Electrostatic Effect.
    b. Multimeter.
    c. Relay.

Answer:

a. Electrostatic effects: Electrostatics is a branch of physics that studies electric charges at rest. Since classical physics, it has been known that some materials such as amber

attract lightweight particles after rubbing. The Greek word for amber, or electron, was the source of the word 'electricity'. Electrostatic phenomena arise from the forces that electric charges exert on each other. Such forces are described by Coulomb's law. Even though electrostatically induced forces seem to be rather weak, some electrostatic forces such as the one between an electron and a proton, that together make up a hydrogen atom, is about 36 orders of magnitude stronger than the gravitational force acting between them.

b. Multimeter: A multimeter or a multitester, also known as a VOM (volt-ohm-milli-ammeter), is an electronic measuring instrument that combines several measurement functions in one unit. A typical multimeter can measure voltage, current, and resistance. Analog multimeters uses a micro-ammeter with a moving pointer to display readings. Digital multimeters (DMM, DVOM) have a numeric display, and may also show a graphical bar representing the measured value. Digital multimeters are now far more common due to their lower cost and greater precision, but analog multimeters are still preferable in some cases, for example when monitoring a rapidly varying value.

c. Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized. When a relay contact is Normally Closed (NC), there is a closed contact when the relay is not energized. In either case, applying electrical current to the contacts will change their state.

Relays are generally used to switch smaller currents in a control circuit and do not usually control power consuming devices except for small motors and Solenoids that draw low amps. Nonetheless, relays can "control" larger voltages and amperes by having an amplifying effect because a small voltage applied to a relays coil can result in a large voltage being switched by the contacts.

17. Define AC Compressor, Condenser & Evaporator in detail.

Answer:

a. The function of a compressor is to remove the vapour produced by the evaporator and to deliver it at a required higher pressure. The compressor can be compared to a heart pumping the blood (the refrigerant) inside the body (the compression cycle). In the basic compression cycle, the compressor is positioned between the evaporator and the condenser. Compressors can be installed in either single or multistage configuration, and can be connected to each other in series or in parallel. The compressor is one of the most important parts of your air conditioning unit. Not only does the compressor play an important role in the cooling process, but it also ensures that the unit works effectively and continually. Compressor Location: The compressor can be found under the hood (Bonnet) of the vehicle, near to the belt drive.

Types of Compressors:

- Positive Displacement Compressor (reduction in volume due to a piston in thermodynamics is considered as positive displacement of the piston).
    - Reciprocating or piston type compressor.
    - Screw compressor.
    - Scroll compressor.
    - Rotary compressor.
- Dynamic compressor.
    - Centrifugal or turbo compressor.

b. In systems involving heat transfer, a condenser is a device or unit used to condense a gaseous substance into a liquid state through cooling. In so doing, the latent heat is released by the substance and transferred to the surrounding environment. Condensers are used for efficient heat rejection in many industrial systems. Condensers can be made according to numerous designs, and come in many sizes ranging from rather small (hand-held) to very large (industrial-scale units used in plant processes). For example, a refrigerator uses a condenser to get rid of heat extracted from the interior of the unit to the outside air.

Condensers are used in air conditioning, industrial chemical processes such as distillation, steam power plants and other heat-exchange systems. Use of cooling water or surrounding air as the coolant is common in many condensers.

Types of Condensers:

- Air-cooled Condenser.
- Water-cooled Condenser.
- Evaporative Condenser.

c. An evaporator is a device in a process used to turn the liquid form of a chemical substance such as water into its gaseous-form/vapour. The liquid is evaporated, or vaporized, into a gas form of the targeted substance in that process.

The air-conditioning evaporator is a small radiator inside the dashboard that provides cold air for the air-conditioning system. It's called the evaporator because it's where the freezing liquid refrigerant takes on any heat from the air blown through it and changes into a gaseous state (evaporating it) before returning it to the air-conditioning condenser to shed the heat; the process is constantly repeated. The air that emerges from the air conditioner is cold as a result.

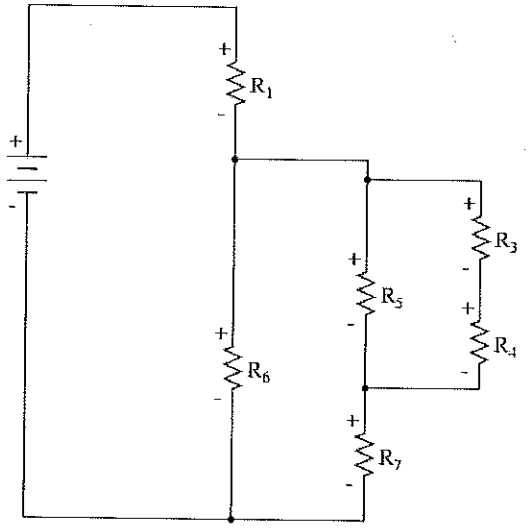
The evaporator is typically hidden inside the vehicle's dashboard and can be labour-intensive to replace, which then requires a full system recharge. Unlike a ruptured heater core, which can leak engine coolant into the foot wells, a leak in the evaporator releases only refrigerant vapour. A clogged drainage channel is a common cause of water in the front foot wells.

Types of Evaporator:

- Natural/forced Circulation Evaporator.
- Falling Film Evaporator.
- Rising Film (Long Tube Vertical) Evaporator.
- Climbing and Falling-film Plate Evaporators.
- Multiple Effect Evaporators.
- Agitated Thin Film Evaporator.

18. Solve the mixed-circuit wiring diagram, and find out the following quantities as given below:
    a. Total Resistance.
    b. Total Current.

    (Given: R1 = 100 ohms, R2 = 120 ohms, R3 = 115 ohms, R4 = 200 ohms, R5 = 100 ohms, R6 = 30 ohms & R7 = 150 ohms, Voltage of the battery is 24 Volts)



Solution:

a. R (Total) = 126.48 ohms or 127 ohms.
b. I (Total) = 0.1897 A or 190 mA.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 1st Semester,

End-Sem. Examination

Course Code: AUT1105 **Time: 2 Hours**

Course Name: Automotive Electrical Fundamentals and Air Conditioning

Max. Marks: 50

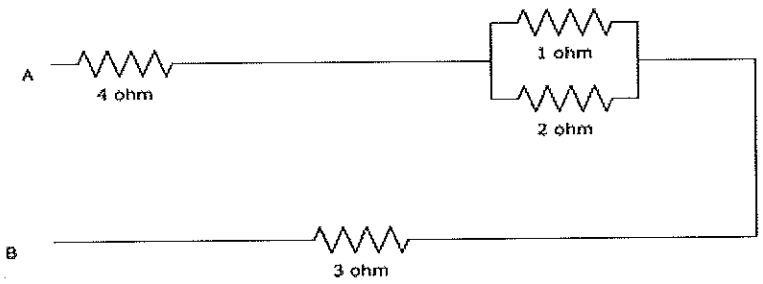
Instruction:

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

Section – A

10X01 = 10 Marks

1. The charging system:
   a. Provides all electrical energy to operate the electrical system while the engine is running.
   b. Restores the energy to the battery after starting the engine.
   c. Uses the principle of magnetic induction to generate electrical power.
   d. All of the above.
2. Why do we use metallic shield for power cables in an automotive electrical?
   a. To make it attractive.
   b. To increase the electrical conductivity.
   c. To protect the wire from the external forces.
   d. All of the above.
3. Calculate the total resistance between the points A and B.
   a. 8 ohms.
   b. 0 ohms.
   c. 7.67 ohms.
   d. 0.48 ohms.



4. OBD used in scanning the sensor faults in an Automotive vehicle stands for....
   a. On-Board Display.
   b. On-Board Data.
   c. On-Board Detection.
   d. On-Board Diagnostic.
5. Which one of the following component is not a part of an electronic component?
   a. Inductor.
   b. Relay.
   c. Wire.
   d. Diode.

6. Among the below options which material is a bad conductor of electricity?
   a. Glass.
   b. Brass.
   c. Silver.
   d. Copper.
7. What are the modes of Heat transfer in a thermodynamic system?
   a. Transmission.
   b. Induction.
   c. Conduction, Convection and Radiation.
   d. None of the above.
8. Which measuring instrument is commonly used in the automotive workshops for auto-electrical measurements?
   a. Ammeter.
   b. Voltmeter.
   c. Oscilloscope.
   d. Multimeter.
9. What is the purpose of a Drain Wire in an electrical cable?
   a. To make it attractive.
   b. To increase the electrical conductivity.
   c. To protect the wire from the external forces.
   d. To reduce the magnetic effect of positive and negative wire in a cable.
10. Mixed-Signal Circuits in an Automotive electronics is also known as.....
   a. Series-parallel Circuits.
   b. Joint Circuits.
   c. Combined Circuits.
   d. Hybrid Circuits.

Section – B

04X04 = 16 Marks

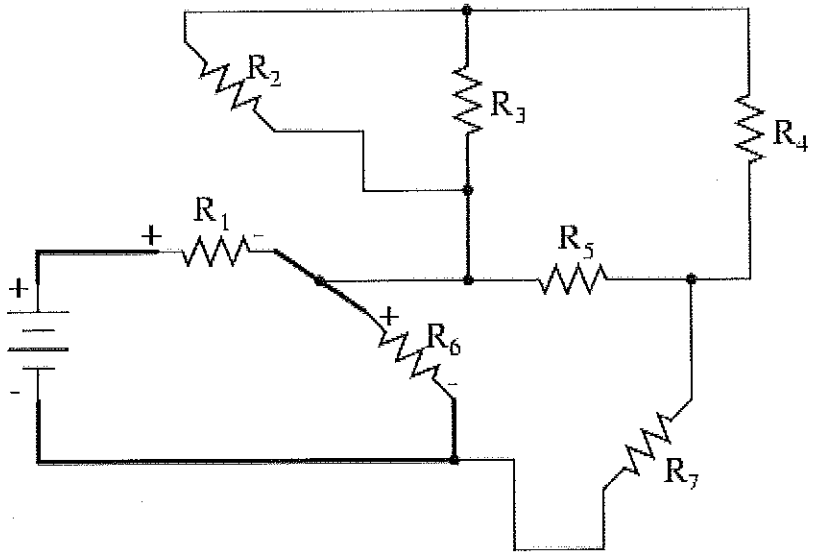
11. Explain the function of an OBD-II Scanning Tool. Name any three parameters of an OBD-II Scanning Tool used in an Automotive Workshop.
12. Solve the following problems:
   a) One cable is damaged on the insulation. A residual current of 8.5A flows at a voltage of 24V. What is the resistance at the damaged area?
   b) If 500A flow at 250V, then what will be the resistance in the circuit?
13. Define the following:
   a. Coefficient of performance.
   b. Heat Engine.
   c. Heat Pump.
   d. Refrigerator.
14. Draw a schematic diagram of a simple VCRS cycle.

Section – C

04X06 = 24 Marks

15. Define AC Compressor, Condenser & Evaporator in detail.
16. Explain the following refrigerants and their properties:
    a. HFC.
    b. FC.
    c. HCFC.
    d. CO2.
    e. NH3.
    f. HC.
17. Write down the standard operating procedure of AC Gas Recycling through Bosch Robinair ACS 261.
18. Solve the mixed-circuit wiring diagram, and find out the following quantities as given below:
    a. Total Resistance.
    b. Total Current.

    (Given: R1 = 100 ohms, R2 = 120 ohms, R3 = 115 ohms, R4 = 200 ohms, R5 = 100 ohms, R6 = 30 ohms & R7 = 150 ohms, Voltage of the battery is 48 Volts)



BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session 2021-22, Summer Semester

B. Voc. Program, 1st Semester,

End-Sem. Examination

Course Code: AUT1105

Course Name: Automotive Electrical Fundamentals & Air Conditioning

Section – A

10X01 = 10 Marks

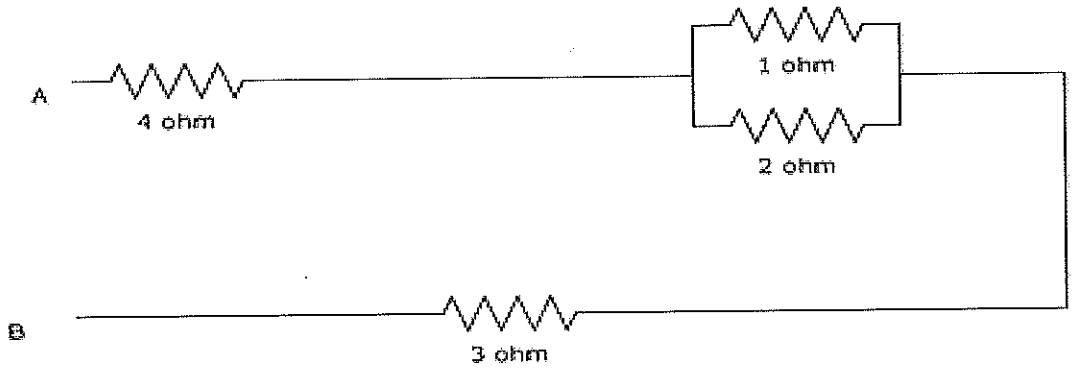
1. The charging system:

Answer: d. All of the above.

2. Why do we use metallic shield for power cables in an automotive electrical?

Answer: c. To protect the wire from the external forces.

3. Calculate the total resistance between the points A and B.



Answer: a. 8 ohms.

4. OBD used in scanning the sensor faults in an Automotive vehicle stands for....

Answer: d. On-Board Diagnostic.

5. Which one of the following component is not a part of an electronic component?

Answer: c. Wire.

6. Among the below options which material is a bad conductor of electricity?

Answer: a. Glass.

7. What are the modes of Heat transfer in a thermodynamic system?

Answer: c. Conduction, Convection and Radiation.

8. Which measuring instrument is commonly used in the automotive workshops for auto-electrical measurements?

Answer: d. Multimeter.

9. What is the purpose of a Drain Wire in an electrical cable?

Answer: d. To reduce the magnetic effect of positive and negative wire in a cable.

10. Mixed-Signal Circuits in an Automotive electronics is also known as.....

Answer: d. Hybrid Circuits.

Section – B

04X04 = 16 Marks

11. Explain the function of an OBD-II Scanning Tool. Name any three parameters of an OBD-II Scanning Tool used in an Automotive Workshop.

Answer:

On-board diagnostics (OBD) is an automotive term referring to a vehicle's self-diagnostic and reporting capability. OBD systems give the vehicle owner or repair technician access to the status of the various vehicle subsystems.

The amount of diagnostic information available via OBD has varied widely since its introduction in the early 1980s versions of on-board vehicle computers. Early versions of OBD would simply illuminate a malfunction indicator light or "idiot light" if a problem was detected but would not provide any information as to the nature of the problem.

Modern OBD implementations use a standardized digital communications port to provide real-time data in addition to a standardized series of diagnostic trouble codes (DTCs) which allow one to rapidly identify and remedy malfunctions within the vehicle.

Various tools are available that plug into the OBD connector to access OBD functions. These range from simple generic consumer level tools to highly sophisticated OEM dealership tools to vehicle telematics devices.

Applications of OBD Tool:

1. It is used to read all diagnostics data from the car.
2. It has Mobile device-based tools and analysis, PC-based scan tools and analysis platforms, Data Loggers, Emission Testing, Driver's supplementary vehicle instrumentation, vehicle telematics.
3. Used to monitor real-time data like:
    a. Engine temperature.
    b. Fuel rate.
    c. O2 sensor voltage.
    d. Battery voltage level.
    e. Time your engine has been running, etc.

12. Solve the following problems:

a) One cable is damaged on the insulation. A residual current of 8.5A flows at a voltage of 24V. What is the resistance at the damaged area?

b) If 500A flow at 250V, then what will be the resistance in the circuit?

Answer:

a. Given: V = 24V, I = 8.5A.

w.k.t. V = IR,

R = V/I = 24/8.5 = 2.82ohms.

b. Given: V = 250 V, I = 500 A.

w.k.t. V = IR,

R = V/I = 250/500 = 0.5 ohms.

13. Define the following:

a. Coefficient of performance.

b. Heat Engine.

c. Heat Pump.

d. Refrigerator.

Answer:

a. Coefficient of performance: A refrigeration system's coefficient of performance (CoP) is very important in determining a system's overall efficiency. It is defined as refrigeration capacity in kW divided by the energy input in kW. While CoP is a very simple measure of performance, it is typically not used for industrial refrigeration in North America. Owners and manufacturers of these systems typically use performance factor (PF). A system's PF is defined as a system's energy input in horsepower divided by its refrigeration capacity in TR. Both CoP and PF can be applied to either the entire system or to system components. For example, an individual compressor can be rated by comparing the energy needed to run the compressor versus the expected refrigeration capacity based on inlet volume flow rate. It is important to note that both CoP and PF for a refrigeration system are only defined at specific operating conditions, including temperatures and thermal loads.

b. Heat Engine: In thermodynamics and engineering, a heat engine is a system that converts heat or thermal energy—and chemical energy—to mechanical energy, which can then be used to do mechanical work. It does this by bringing a working substance from a higher state temperature to a lower state temperature. A heat source generates thermal energy that brings the working substance to the high temperature state. The working substance generates work in the working body of the engine while transferring heat to the colder sink until it reaches a low temperature state. During this process some of the thermal energy is converted into work by exploiting the properties of the working substance. The working substance can be any system with a non-zero heat capacity, but it usually is a gas or liquid. During this process, some heat is normally lost to the surroundings and is not converted to work.

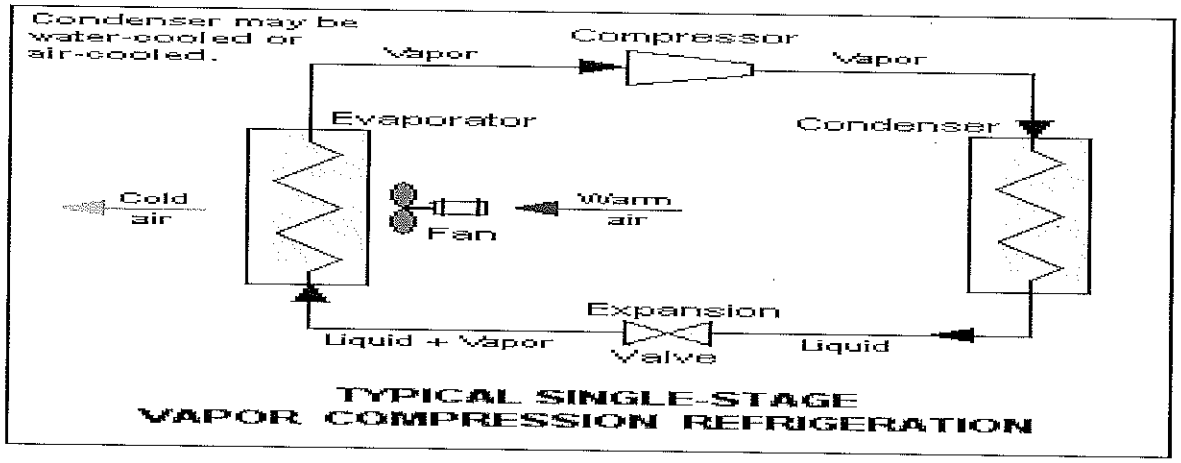
c. Heat Pump: A heat pump is a device that transfers heat energy from a source of heat to what is called a thermal reservoir. Heat pumps move thermal energy in the opposite

direction of spontaneous heat transfer, by absorbing heat from a cold space and releasing it to a warmer one. A heat pump uses external power to accomplish the work of transferring energy from the heat source to the heat sink. The most common design of a heat pump involves four main components – a condenser, an expansion valve, an evaporator and a compressor. The heat transfer medium circulated through these components is called refrigerant.

d. Refrigerator: A refrigerator (colloquially fridge) consists of a thermally insulated compartment and a heat pump (mechanical, electronic or chemical) that transfers heat from the inside of the fridge to its external environment so that the inside of the fridge is cooled to a temperature below the room temperature. Refrigeration is an essential food storage technique in developed countries. The lower temperature lowers the reproduction rate of bacteria, so the refrigerator reduces the rate of spoilage. A refrigerator maintains a temperature a few degrees above the freezing point of water. Optimum temperature range for perishable food storage is 3 to 5 °C (37 to 41 °F). A similar device that maintains a temperature below the freezing point of water is called a freezer. The refrigerator replaced the icebox, which had been a common household appliance for almost a century and a half.

14. Draw a schematic diagram of a simple VCRS cycle.

Answer:



Section – C

04X06 = 24 Marks

15. Define AC Compressor, Condenser & Evaporator in detail.

Answer:

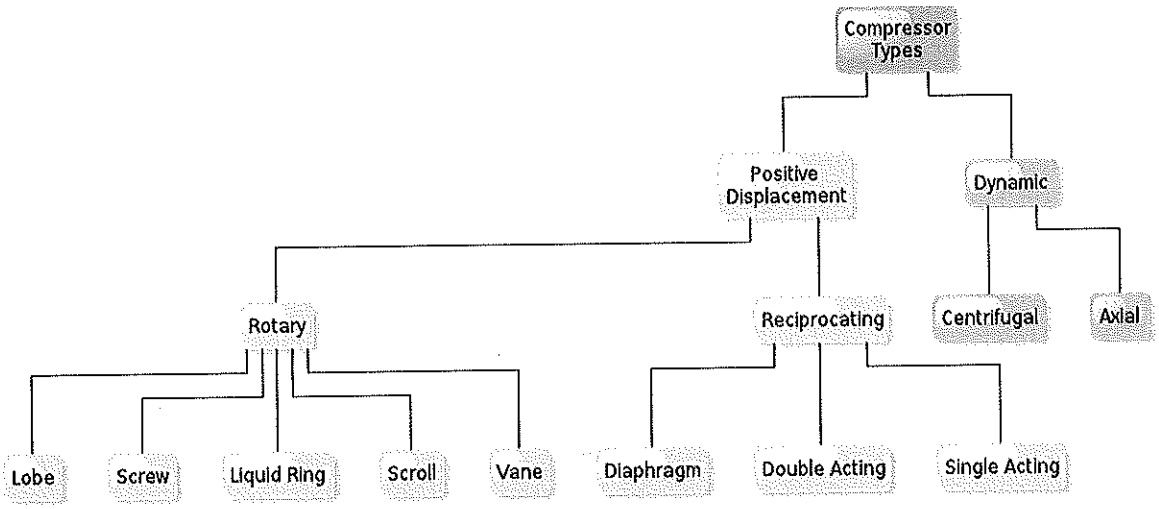
AC Compressor: The function of a compressor is to remove the vapour produced by the evaporator and to deliver it at a required higher pressure. The compressor can be compared to a heart pumping the blood (the refrigerant) inside the body (the compression cycle). In the basic compression cycle, the compressor is positioned between the evaporator and the

condenser. Compressors can be installed in either single or multistage configuration, and can be connected to each other in series or in parallel.

The compressor is one of the most important parts of your air conditioning unit. Not only does the compressor play an important role in the cooling process, but it also ensures that the unit works effectively and continually.

Compressor Location

The compressor can be found under the hood (Bonnet) of the vehicle, near to the belt drive.



AC Condenser: In systems involving heat transfer, a condenser is a device or unit used to condense a gaseous substance into a liquid state through cooling. In so doing, the latent heat is released by the substance and transferred to the surrounding environment. Condensers are used for efficient heat rejection in many industrial systems. Condensers can be made according to numerous designs, and come in many sizes ranging from rather small (hand-held) to very large (industrial-scale units used in plant processes). For example, a refrigerator uses a condenser to get rid of heat extracted from the interior of the unit to the outside air.

Condensers are used in air conditioning, industrial chemical processes such as distillation, steam power plants and other heat-exchange systems. Use of cooling water or surrounding air as the coolant is common in many condensers.

A condenser is designed to transfer heat from a working fluid (e.g. water in a steam power plant) to a secondary fluid or the surrounding air. The condenser relies on the efficient heat transfer that occurs during phase changes, in this case during the condensation of a vapour into a liquid. The vapour typically enters the condenser at a temperature above that of the secondary fluid. As the vapour cools, it reaches the saturation temperature, condenses into liquid and releases large quantities of latent heat. As this process occurs along the condenser, the quantity of vapour decreases and the quantity of liquid increases; at the outlet of the condenser, only liquid remains. Some condenser designs contain an additional length to sub-cool this condensed liquid below the saturation temperature.

Types of condenser:

- Air-cooled Condenser.
- Water-cooled Condenser.
- Evaporative Condenser.

Evaporator: An evaporator is a device in a process used to turn the liquid form of a chemical substance such as water into its gaseous-form/vapour. The liquid is evaporated, or vaporized, into a gas form of the targeted substance in that process.

The air-conditioning evaporator is a small radiator inside the dashboard that provides cold air for the air-conditioning system. It's called the evaporator because it's where the freezing liquid refrigerant takes on any heat from the air blown through it and changes into a gaseous state (evaporating it) before returning it to the air-conditioning condenser to shed the heat; the process is constantly repeated. The air that emerges from the air conditioner is cold as a result.

The evaporator is typically hidden inside the vehicle's dashboard and can be labour-intensive to replace, which then requires a full system recharge. Unlike a ruptured heater core, which can leak engine coolant into the foot wells, a leak in the evaporator releases only refrigerant vapour. A clogged drainage channel is a common cause of water in the front foot wells.

Types of Evaporator:

- Natural/forced Circulation Evaporator.
- Falling Film Evaporator.
- Rising Film (Long Tube Vertical) Evaporator.
- Climbing and Falling-film Plate Evaporators.
- Multiple Effect Evaporators.
- Agitated Thin Film Evaporator.

16. Explain the following refrigerants and their properties:
    a. HFC.
    b. FC.
    c. HCFC.
    d. CO2.
    e. NH3.
    f. HC.

Answer:

a. HFC: HydroFluoroCarbons

   The hydrofluorocarbons are refrigerants that contain no chlorine and are not harmful to the ozone layer. However, their impact on global warming is very large compared

with traditional refrigerants. The most common HFC refrigerants available since the ban on HCFCs are presented.

b. FC: FluoroCarbons

Fluorocarbons contain no chlorine and are not harmful to the ozone layer. However, they are extremely stable, and they have a high GWP. R218 is an example of a fluorocarbon, and FCs are also present in the mixtures R403 and R408.

c. HCFC: HydroChloroFluoroCarbons

The slow phase-out of CFCs shows it is a costly process. However, and more importantly, it also shows the problems and indecisiveness surrounding the availability of HCFCs, which were officially indicated as temporary (until 2030) substitutes for CFCs. The hasty actions of the European Union that culminated in the ban of HCFCs, immediately for refrigeration and soon (2004 at the latest) for air conditioning, has upset the industry's programs and plans.

The HCFCs contain less chlorine than CFCs, which means a lower ODP. Examples of hydrochlorofluorocarbons include R22, R123 and R124.

d. CO2: Carbon Dioxide

R744, carbon dioxide, has several attractive characteristics: non-flammable, does not cause ozone depletion, very low toxicity index (safety A1), available in large quantities, and low cost. However, it also has a low efficiency and a high operating pressure (approximately 10 times higher than R134a). For the two latter reasons, efforts are needed to improve its refrigeration cycle and related technology, particularly heat exchangers and expansion devices. A major forthcoming CO2 application seems to be air conditioning in the automotive industry. Heat pumps could also benefit from CO2 due to the higher temperature that can be obtained even at very low ambient temperatures.

e. NH3: Ammonia

Ammonia, R717, is an attractive refrigerant alternative. It has been used in refrigeration systems since 1840 and in vapour compression since 1860. In terms of its properties, it should be considered a high-class refrigerant. Furthermore, its ODP and GWP are 0. However, although it is a selfalerting gas, i.e. leaks can easily be detected by the smell, ammonia is very hazardous even at low concentrations because the smell often causes panic. This is the main reason why ammonia was withdrawn from applications for use by unskilled people and retained only for industrial applications.

It is also quite common in commercial refrigeration, although safety regulations require that it be used with a secondary distribution loop. Obviously, this secondary loop reduces the efficiency.

f. HC: HydroCarbons

Hydrocarbons are a very limited solution to the environmental problems associated with refrigerants. They are harmless to the ozone layer (ODP = 0) and have hardly any direct greenhouse effect (GWP<5), but they are highly flammable. The use of HCs as refrigerants is confined to Europe, because many other countries elsewhere have banned the use of flammable gas in the presence of the public. According to the standards ISO 55149 and EN 378.2000, this should apply also in Europe. However, the standard IEC 355.2.20 allows the use of HCs in household refrigerators with refrigerant charges up to 150 g.

This standard has opened the way for some European refrigerator manufacturers to produce household refrigerators with flammable isobutene, R600a.

These have been accepted enthusiastically by environmentalists, and have achieved great success in the market.

17. Write down the standard operating procedure of AC Gas Recycling through Bosch Robinair ACS 261.

Answer:

- The student should wear appropriate PPE's like safety goggles, safety gloves, earplugs, nose mask, etc. while working on Robinair ACS 261 A/C recycling machine.
- Check the power supply of the machine, it should be three phase.
- Check the cooling effect of the vehicle by temperature measuring instrument.
- Check the unwanted sound of the compressor.
- Check the compressor oil level (Top-up if required).
- Check the refrigerant amount from the refrigerant tank (if less then fill it up).
- Check the connections of the A/C line.
- Turn ON the machine.
- Connect the high pressure and low pressure valves with hose reel connectors.
- Select A/C Servicing.
- Select Manual / Auto Mode of A/C recycling.
- Select Recovery of refrigerant (PI Time of 1 minute), then select vacuuming of A/C System Line (Vacuum. Creation time for 20 minutes and Vacuum. Holding time for 5 minutes), Oil recharging (10 ml or *as per cabin size and vehicle manual specifications), Refrigerant charging (300 gm to 900 gm as per mentioned in the manual as per cabin size), Hose pipe draining.

Process:

Step 1: Start recovery of refrigerant gas from the A/c System.

Step 2: After recovery start vacuum creation and vacuum holding in the line of A/C System.

Step 3: After step 2, start refilling of the compressor oil and refrigerant in the A/C System.

Step 4: After refilling, remove the hose connectors from the outlet valves, and start the hose draining process to ensure that no refrigerant gas should remain in the hose pipe of the Robinair ACS 261.

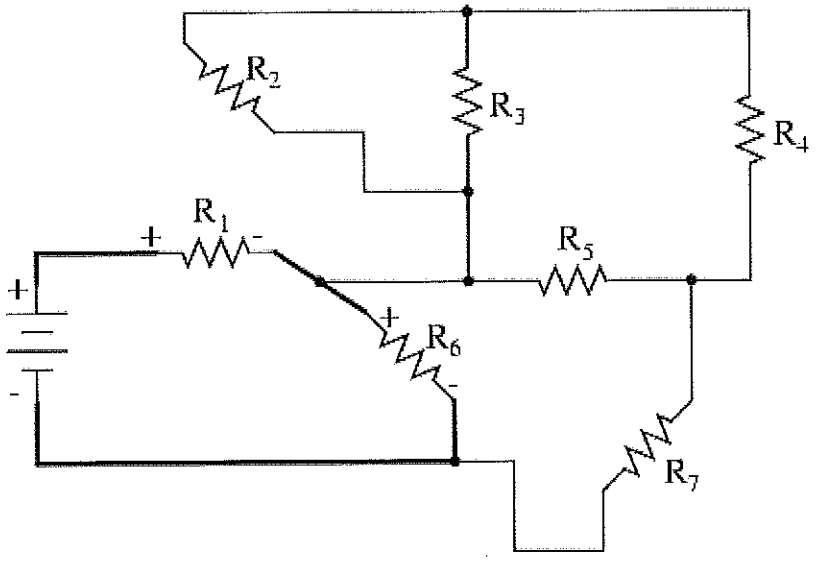
Step 5: Note down the summary screen of the Robinair ACS 261 for the final results of A/C Recycling in a vehicle to know the amount recovered and consumed & the time taken for the process to estimate the cost of job work.

Step 6: Switch OFF the machine and remove the power supply.

- Check the cooling effect of the vehicle by temperature measuring instrument after the process of recycling of refrigerant by turning ON the vehicle for 15 minutes.
- Check the workplace properly and manage it from the initial phase of the process for better working of the job.

18. Solve the mixed-circuit wiring diagram, and find out the following quantities as given below:
    a. Total Resistance.
    b. Total Current.

    (Given: R1 = 100 ohms, R2 = 120 ohms, R3 = 115 ohms, R4 = 200 ohms, R5 = 100 ohms, R6 = 30 ohms & R7 = 150 ohms, Voltage of the battery is 48 Volts)



Solution:

a. R (Total) = 129.51 ohms.
b. I (Total) = 370 mA.

Set A, Q.P.

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 1st Semester

End Sem. Examination

Course Code: AUT1106 **Time: 2 Hour**

Course Name: Automotive tools and measurement **Max. Marks: 50**

Instruction:

1. Attempt all questions.
2. Use of Calculators is prohibited.
3. Section A contains 10 Questions. Each question carries 1 Marks.
4. Section B contains 4 Questions. Each question carries 4 Marks.
5. Section C contains 4 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

Q1. Why do not we use second angle and fourth angle projection?

a) Due to overlapping

b) Due to complications

c) Due to lacking

d) None of the above

Q2. Which type of measurement does not provide numerical values?

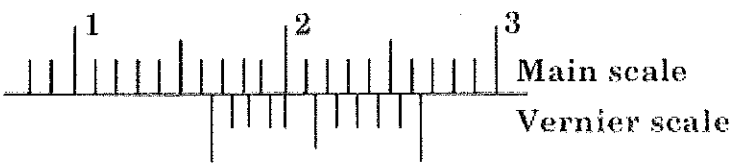
a) Gauging

b) Measuring

c) Both (A) & (B)

d) None of the above

Q3. What is the least count of the instrument?



a) 0.1cm

b) 0.01cm

c) 1m

d) 0.01mm

Q.4 Least count defines the.....

a) Smallest unit we can measure

b) Smallest dimension

c) Smallest length

d) None of these

Q5. _____ is angle between the top face of cutting point and normal to work surface at cutting edge

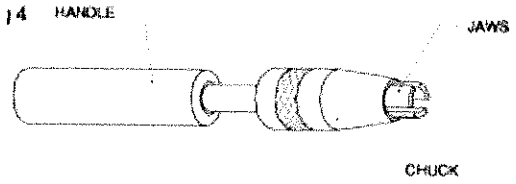
a) Clearance angle

b) Point angle

c) Rake angle

d) None of the above

Q.6 Name the equipment



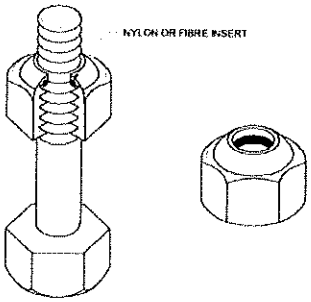
a) Pin vice

b) Measuring Gauge

c) Both (A) & (B)

d) None of the above

Q.7 Name the type of nut



a) Self-lock nut

b) T-Nut

c) Square nut

d) None of the above

Q8. This type of bolts is used when the assembly is subjected to alternating load condition Continuously

a) Anti-Fatigue Bolts

b) Body fit Bolts

c) Studs

d) None of the above

Q9. Name the projection symbol

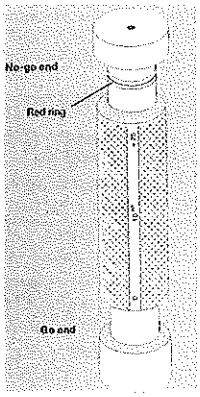
a) First angle

b) Second angle

c) Third angle

d) None of the above

Q10. Name the gauge



a) Plug gauge

b) Thread gauge

c) Slip gauge

d) None of the above

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Section – B

04X04 = 16 Marks

Q11. Write Different types of nuts and bolts.

Q12. Write different angles of chisel and their effects.

Q13. Explain different types of lines with their uses.

Q14. Write short note on measuring errors.

Section – C

04X06 = 24 Marks

Q15. What is fit? Name types of fit

Q16. Write short note on surface finish indication

Q.17 Differentiate between first angle and third angle projection?

Q18. Explain the parts of Vernier caliper with diagram.

Set A, MS

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 1st Semester

Answer sheet (Set A) End Sem. Examination

Course Code: AUT1106 Time: 2 Hour

Course Name: Automotive tools and measurement Max. Marks: 50

Instruction:

1. Attempt all questions.
2. Use of Calculators is prohibited.
3. Section A contains 10 Questions. Each question carries 1 Marks.
4. Section B contains 4 Questions. Each question carries 4 Marks.
5. Section C contains 4 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

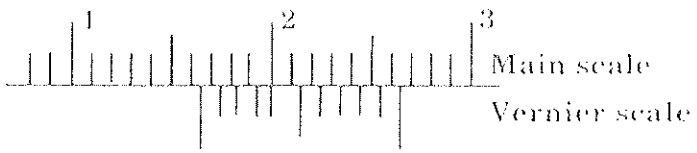
Q1. Why do not we use second angle and fourth angle projection?

a. **Due to overlapping**
b. Due to complications
c. Due to lacking
d. None of the above

Q2. Which type of measurement does not provide numerical values?

a. **Gauging**
b. Measuring
c. Both (A) & (B)
d. None of the above

Q3. What is the least count of the instrument?



a. 0.1cm
b. 0.01cm

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

c. 1m

d. 0.01mm

Q.4 The least count defines the.....

a. Smallest unit we can measure

b. Smallest dimension

c. Smallest length

d. None of these

Q5. _____ is angle between the top face of cutting point and normal to work surface at cutting edge

a. Clearance angle

b. Point angle

c. Rake angle

d. None of the above

Q.6 Name the equipment

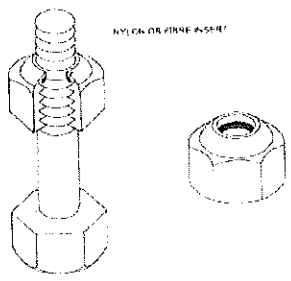
a. Pin vice

b. Measuring Gauge

c. Both (A) & (B)

d. None of the above

Q.7 Name the type of nut

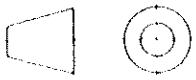


a. **Self lock nut**
b. Square nut
c. T-Nut
d. None of the above

Q8. This type of bolts is used when the assembly is subjected to alternating load condition continuously.

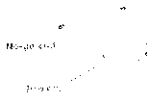
a. **Anti-Fatigue Bolts**
b. Body fit Bolts
c. Studs
d. None of the above

Q9. Name the projection symbol



a. **First angle**
b. Second angle
c. Third angle
d. None of the above

Q10. Name the gauge



a. **Plug gauge**
b. Thread gauge
c. Slip gauge
d. None of the above

Section – B

04X04 = 16 Marks

Q11. Write Different types of nuts and bolts.

Ans.

There are different types of nut:

- Hexagonal nuts
- Square nuts
- Self-locking nuts
- T- nuts
- Slotted & Castle nuts
- Round nuts
- Slotted Round nuts

Depending upon type of application, different types of bolts are used:

- Bolts with clearance hole
- Body fit bolt
- Anti-fatigue bolt
- Studs

Q.12 Write different angles of chisel and their effects.

Ans.

Point Angle:

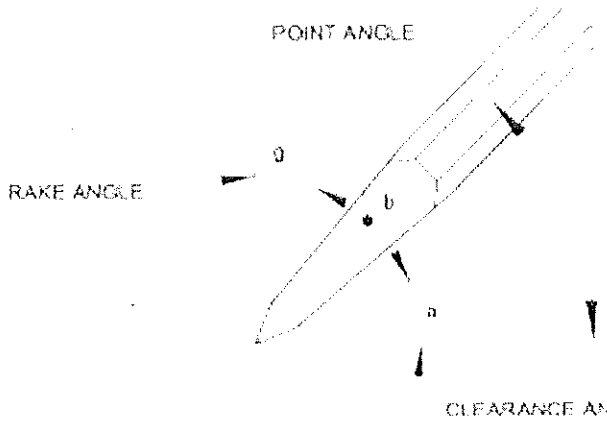
•Correct point/cutting angles of chisel depends on the material to be chipped, sharp angles for soft materials and wide angles for hard materials

•Rake Angle:

•Rake angle is angle between the top face of cutting point and normal to work surface at cutting edge

•Clearance Angle:

•Clearance angle is angle between the bottom face of point and tangent to the work surface originating at the cutting edge



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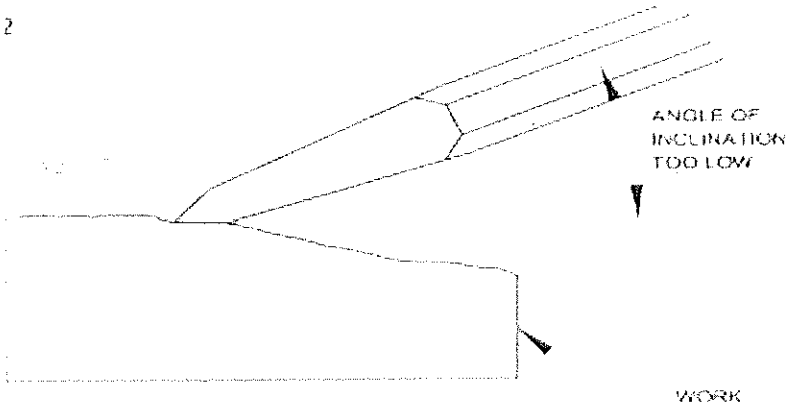
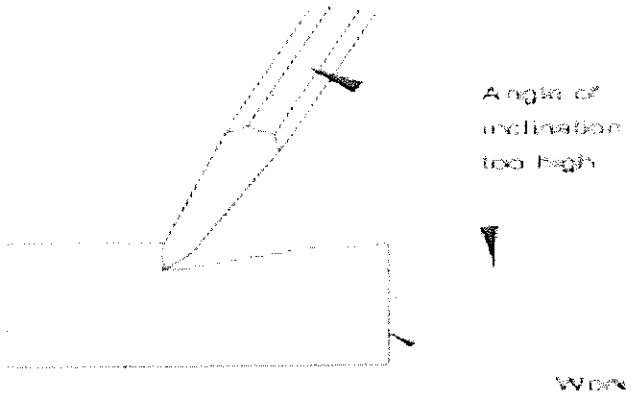




Effects -

- Angle of Inclination too low, Rake angle increases cutting edge cannot penetrate into work-piece
- Angle of Inclination too high, Rake angle decreases, cutting edge digs in, and the cut progressively increase

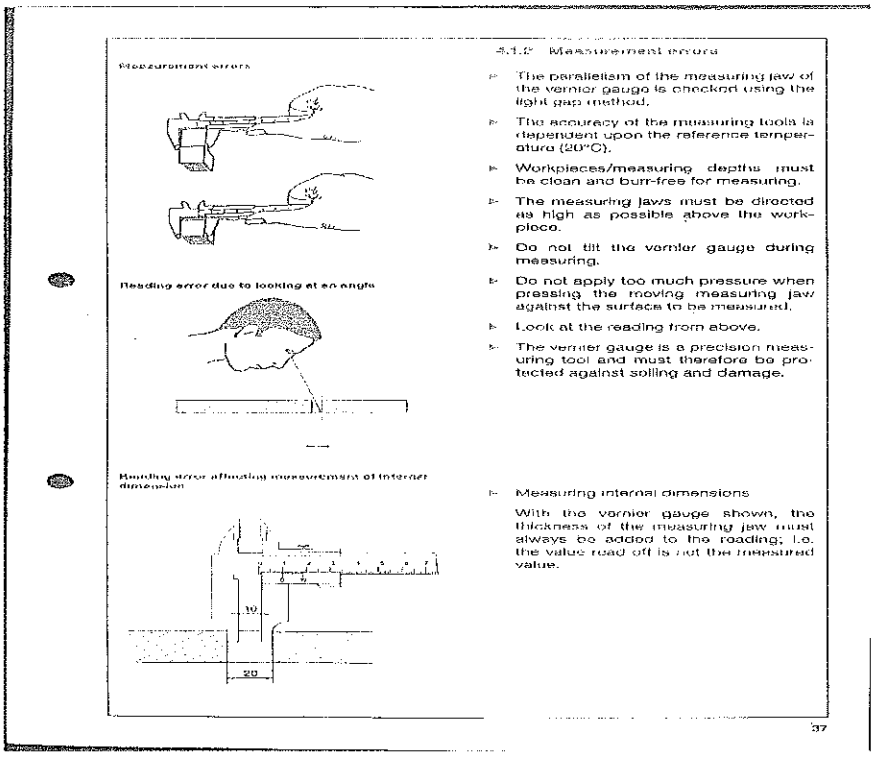
Q.13 Explain different types of lines with their uses.

Ans.

Illustration	Application
Thick	Outlines, visible edges, surface boundaries of objects, margin lines
Continuous thin Continuous thin wavy Continuous thin with zig-zag Short dashes, gap 1, length 3 mm	Dimension lines, extension lines, section lines leader or pointer lines, construction lines, boarder lines Short break lines or irregular boundary lines – drawn freehand Long break lines Invisible or interior surfaces
Short dashes	Center lines, locus lines Alternate long and short dashes in a proportion of 6:1,
Long chain thick at end and thin elsewhere	Cutting plane lines

Q.14 Write short note on measuring errors.

Ans.



Section – C

04X06 = 24 Marks

Q15. What is fit? Name types of fit

Ans.

Manufactured parts are required to mate with one another during assembly.

- The relationship between the two mating parts that are to be assembled, that is, the hole and the shaft, with respect to the difference in their dimensions before assembly is called a fit.
- An ideal fit is required for proper functioning of the mating parts. Three basic types of fits can be identified, depending on the actual limits of the hole or shaft:

a. Clearance fit
b. Interference fit
c. Transition fit

Clearance fit: The largest permissible diameter of the shaft is smaller than the diameter of the smallest hole.

- In case of clearance fit, the difference between the sizes is always positive.

Interference fit: The minimum permissible diameter of the shaft exceeds the maximum allowable diameter of the hole.

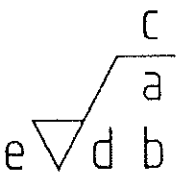
- This type of fit always provides interference. Interference fit is a form of a tight fit. Tools are required for the precise assembly of two parts with an interference fit.
- In an interference fit, the difference between the sizes is always negative.

Transition fit: Occurs when two tolerance mating parts are sometimes and interference fit and sometimes clearance fit when assembled.

Q16. Write short note on surface finish indication

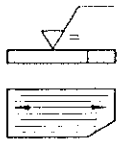
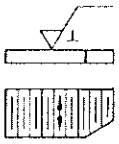
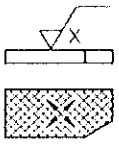
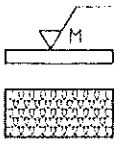
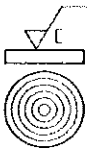
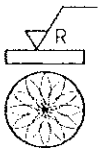
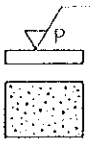
Ans.

Indication of surface finish cf. DIN EN ISO 1302 (2002-06)

Symbol	Meaning	Additional marks
	All manufacturing processes are allowed.	a surface parameter[1] with numerical value in µm, transfer characteristic[2]/individual evaluation length in mm
	Material removal specified, e.g. turning, milling.	b secondary surface finish requirement (as described for a)
	Material removal not allowed or the surface remains in delivered condition.	c manufacturing process
	All surfaces around the contour must have the same surface finish.	d symbol for the required groove direction (table page 100)
		e machining deviation in mm

Indication of surface finish cf. DIN EN ISO 1302 (2002-06)

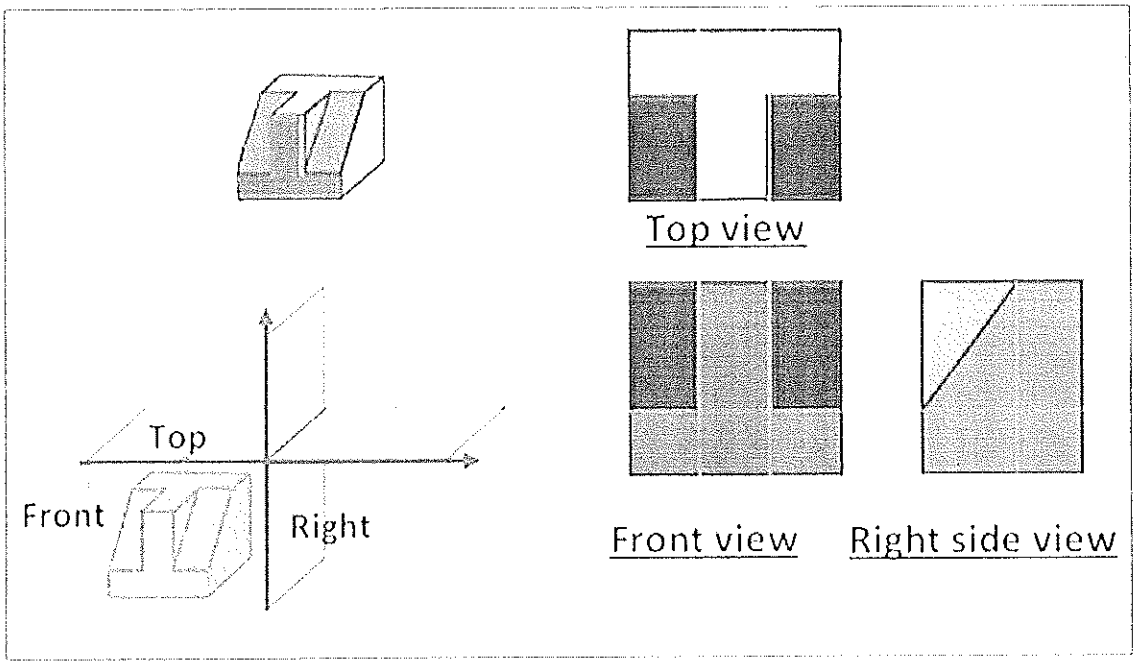
Symbols for groove direction

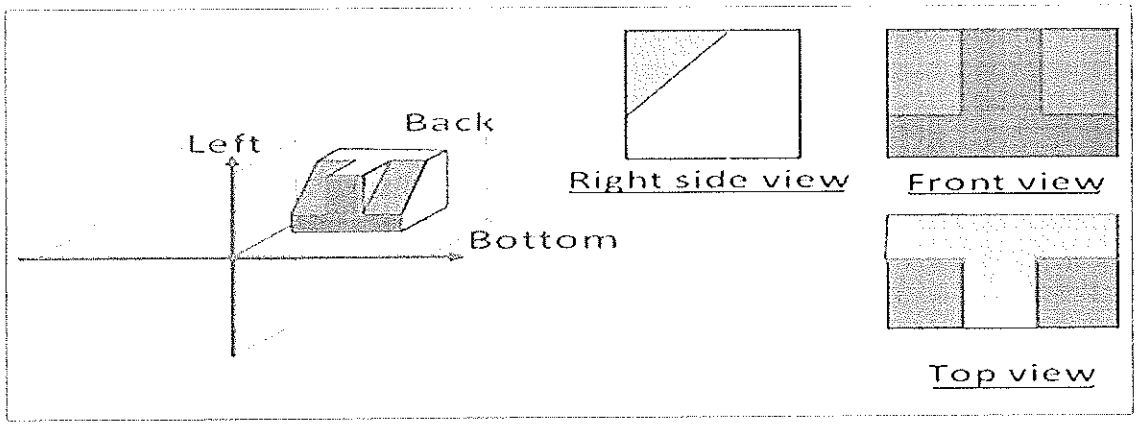
Representation of groove direction							
Symbol	=	⊥	X	M	C	R	P
Groove direction	parallel to the projection plane	perpendicular to the projection plane	crossed in two angular directions	multi-directional	approximately concentric to the center	approximately radial to the center	non-grooved surface, non-directional or troughs

Q.17 Differentiate between first angle and third angle projection?

Ans.

First angle projection	Third-angle projection
Object is kept in the first quadrant.	Object is assumed to be kept in the third quadrant.
Object lies between observer and the plane of projection.	Plane of projection lies between the observer and the object.
The plane of projection is assumed to be non-transparent.	The plane of projection is assumed to be transparent.
Front (elevation) view is drawn above the XY line	Front (elevation) view is drawn below the XY line
Top (plan) view is drawn below the XY line	Top (plan) view is drawn above the XY line
Left view is projected on the right plane and vice versa	Left view is projected on the left plane itself.
Followed in India, European countries	Followed in USA

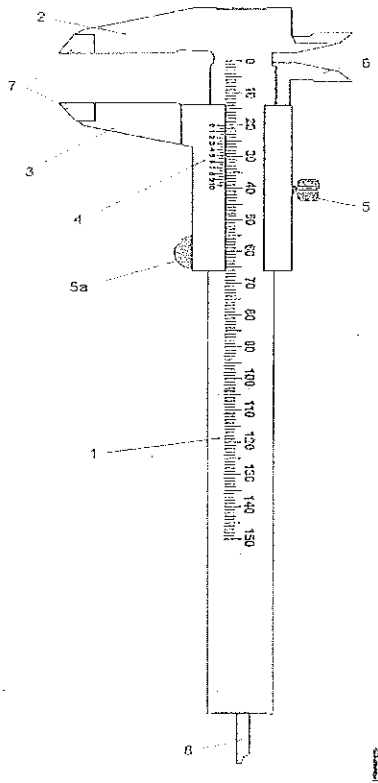




Q18. Explain the parts of Vernier caliper with diagram.

Ans.

Vernier gauge



Components of a vernier gauge

A vernier gauge consists of the following parts:

1. The bar with the line graduation in millimetres
2. The fixed measuring jaw.
3. The adjustable measuring jaw.
4. The slide with vernier graduation
5. The retaining screw (type 1A)

5a. The clamp (type 2A)

6. The cutting areas for measuring internal dimensions
7. The measuring areas for measuring threads
8. The depth measuring rod for measuring drill depths, groove depths and ridge heights

Set B, QP

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 1st Semester

End Sem. Examination

Course Code: AUT1106 Time: 2 Hour

Course Name: Automotive tools and measurement Max. Marks: 50

Instruction:

1. Attempt all questions.
2. Use of Calculators is prohibited.
3. Section A contains 10 Questions. Each question carries 1 Marks.
4. Section B contains 4 Questions. Each question carries 4 Marks.
5. Section C contains 4 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

Q1. Fine adjusting screw of a Vernier caliper is used to _____.

a) Lock vernier carrier

b) Take accurate measurement

c) Lock inner jaw

d) Lock fine dusting carrier

Q2. Least count of an outside micrometer is 0.01mm. Range of the micrometer is 75-100 mm. The barrel reading is 15.5 mm and the tenth thimble graduation coincides with the barrel datum line. The reading is _____

a) 15.60 mm

b) 15.06 mm

c) 15.50 mm

d) 15.40 mm

Q3. Which type of measurement does not provide numerical values?

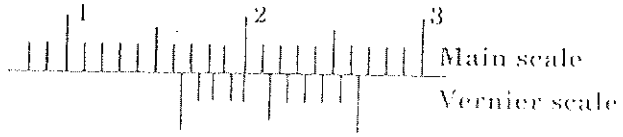
a) Gauging

b) Measuring

c) Both (A) & (B)

d) None of the above

Q4. What is the least count of the instrument?



a) 0.1cm

b) 0.01cm

c) 1m

d) 0.01mm

Q5. Why do not we use second angle and fourth angle projection?

a) Due to overlapping

b) Due to complications

c) Due to lacking

d) None of the above

Q6. Least count defines the.....

a) Smallest unit we can measure

b) Smallest dimension

c) Smallest length

d) None of these

Q7. _____ is angle between the top face of cutting point and normal to work surface at cutting edge

a) Clearance angle

b) Point angle

c) Rake angle

d) None of the above

Q8. This type of bolts is used when the assembly is subjected to alternating load condition continuously.

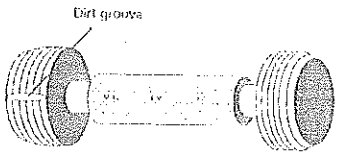
a) Anti-Fatigue Bolts

b) Body fit Bolts

c) Studs

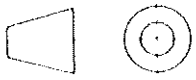
d) None of the above

Q9. Name the gauge



a) Plug gauge
b) Thread gauge
c) Slip gauge
d) None of the above

Q10. Name the projection symbol



a) First angle
b) Second angle
c) Third angle
d) None of the above

Section – B

04X04 = 16 Marks

Q11. What is light gap method; explain work technique of radius gauge.

Q12. Explain different types of lines with their uses.

Q13. Write short note on measuring errors.

Q14. Write short note on surface finish indication

Section – C

04X06 = 24 Marks

Q15. Differentiate between first angle and third angle projection?

Q16. What is fit? Name types of fit

Q17. Explain projection methods.

Q18. Explain the types of machine screws.

Set B

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 1st Semester

Answer sheet (Set B) End Sem. Examination

Course Code: AUT1106 **Time: 2 Hour**

Course Name: Automotive tools and measurement **Max. Marks: 50**

Instruction:

1. Attempt all questions.
2. Use of Calculators is prohibited.
3. Section A contains 10 Questions. Each question carries 1 Marks.
4. Section B contains 4 Questions. Each question carries 4 Marks.
5. Section C contains 4 Questions. Each question carries 6 Marks.

Section – A

10X01 = 10 Marks

Q1. Fine adjusting screw of a Vernier caliper is used to _____.

a) Lock vernier carrier

b) Take accurate measurement

c) Lock inner jaw

d) Lock fine dusting carrier

Q2. Least count of an outside micrometer is 0.01mm. Range of the micrometer is 75-100 mm. The barrel reading is 15.5 mm and the tenth thimble graduation coincides with the barrel datum line. The reading is _____

a. 15.60 mm

b. 15.06 mm

c. 15.50 mm

d. 15.40 mm

Q3. Which type of measurement does not provide numerical values?

a. Gauging

b. Measuring

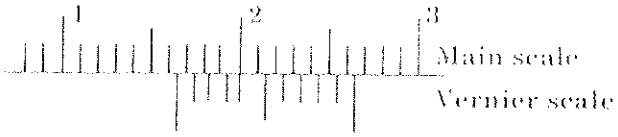
c. Both (A) & (B)

d. None of the above

Q4. What is the least count of the instrument?

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY



a. 0.1cm

b. 0.01cm

c. 1m

d. 0.01mm

Q5. Why do not we use second angle and fourth angle projection?

a.) Due to overlapping

b.) Due to complications

c.) Due to lacking

d.) None of the above

Q6. Least count defines the.....

a. Smallest unit we can measure

b. Smallest dimension

c. Smallest length

d. None of these

Q7. _____ is angle between the top face of cutting point and normal to work surface at cutting edge

a. Clearance angle

b. Point angle

c. Rake angle

d. None of the above

Q8. This type of bolts is used when the assembly is subjected to alternating load condition continuously.

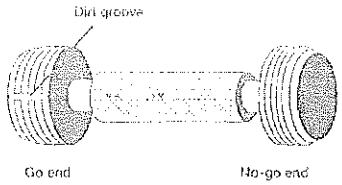
a. Anti-Fatigue Bolts

b. Body fit Bolts

c. Studs

d. None of the above

Q9. Name the gauge



a. Plug gauge

b. Thread gauge

c. Slip gauge

d. None of the above

Q10. Name the projection symbol

a. First angle

b. Second angle

c. Third angle

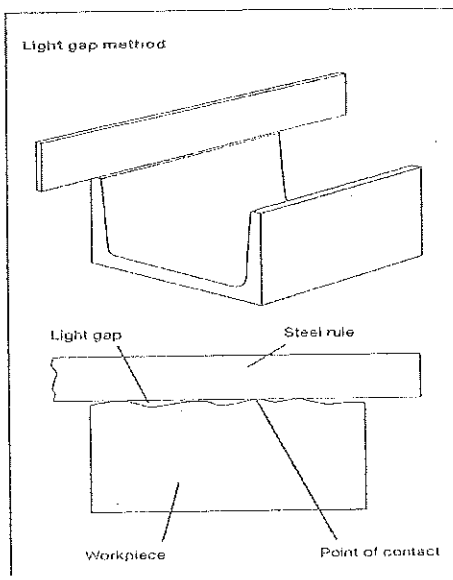
d. None of the above

Section – B

04X04 = 16 Marks

Q.11 What is light gap method, explain work technique of radius gauge.

Ans.



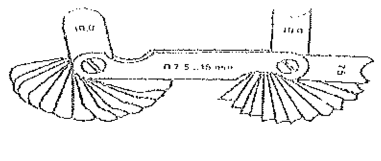
The light gap method

The light gap method is used to check surface evenness. The method involves placing a steel rule perpendicular on the surface to be checked.

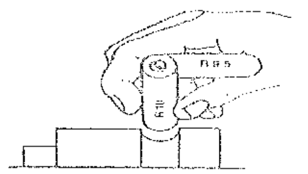
Hold the workpiece up against a light source with the steel rule at eye level. A light gap will appear where there are recesses.

To achieve an even surface, file down the problem areas identified.

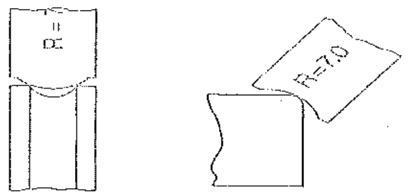
Radius gauge



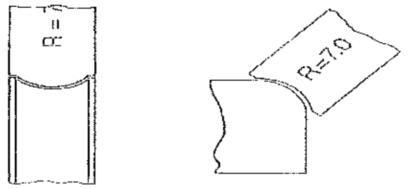
Internal radius



Work technique



Curvature too small



Curvature matches gauge

Radius gauge (radius template)

Grooves and raised external radii are checked with a radius template. The rounding of the test part is compared with the corresponding profile of the gauge. The check uses the light gap method. With a radius gauge, the radius is indicated in "millimetres" on a metal template. The radius template is referred to as a gauge since each template only has a single measurement.

Work technique

Curvatures which are part of circles are checked with radius gauges. During the check, the gauge is held at right angles to the workpiece. The light gap makes errors visible.

The terms external radius and internal radius are used in technical language.

An external radius is arched outwards or raised (convex).

An internal radius is arched inwards or hollow (concave).

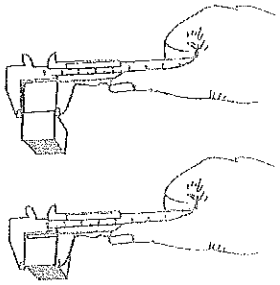
Q.12 Explain different types of lines with their uses.

Ans.

Illustration	Application
Thick ———————	Outlines, visible edges, surface boundaries of objects, margin lines
Continuous thin ———————	Dimension lines, extension lines, section lines leader or pointer lines, construction lines, boarder lines
Continuous thin wavy	Short break lines or irregular boundary lines – drawn freehand
Continuous thin with zig-zag	Long break lines
Short dashes, gap 1, length 3 mm - - - - - - - - - - -	Invisible or interior surfaces
Short dashes — · — · — · — · — · — · — · —	Center lines, locus lines Alternate long and short dashes in a proportion of 6:1,
Long chain thick at end and thin elsewhere	Cutting plane lines

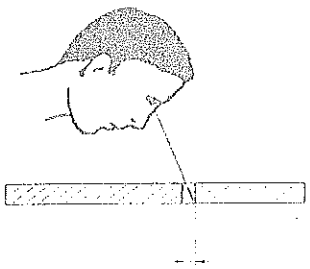
Q13. Write short note on measuring errors.

Measurement errors

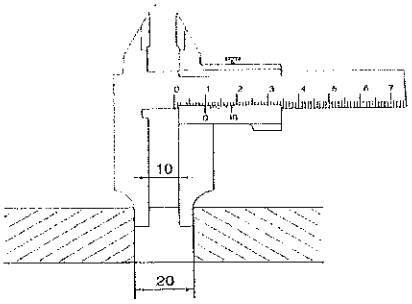


- The parallelism of the measuring jaw of the vernier gauge is checked using the light gap method.
- The accuracy of the measuring tools is dependent upon the reference temperature (20°C).
- Workpieces/measuring depths must be clean and burr-free for measuring.
- The measuring jaws must be directed as high as possible above the workpiece.
- Do not tilt the vernier gauge during measuring.
- Do not apply too much pressure when pressing the moving measuring jaw against the surface to be measured.
- Look at the reading from above.
- The vernier gauge is a precision measuring tool and must therefore be protected against soiling and damage.

Reading error due to looking at an angle



Reading error affecting measurement of internal dimension



- Measuring internal dimensions

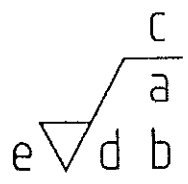
  With the vernier gauge shown, the thickness of the measuring jaw must always be added to the reading; i.e. the value read off is not the measured value.

Q14. Write short note on surface finish indication

Ans.

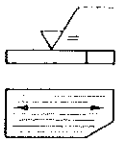
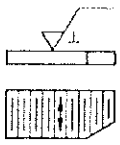
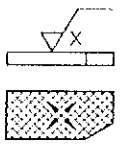
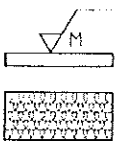
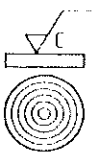
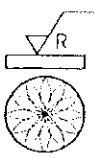
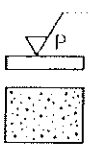
Indication of surface finish cf. DIN EN ISO 1302 (2002-06)

Symbol	Meaning	Additional marks
	All manufacturing processes are allowed.	a surface parameter[1] with numerical value in µm, transfer characteristic[2]/individual evaluation length in mm
	Material removal specified, e.g. turning, milling.	b secondary surface finish requirement (as described for a)
	Material removal not allowed or the surface remains in delivered condition.	c manufacturing process
	All surfaces around the contour must have the same surface.	d symbol for the required groove direction (table page 100)



Indication of surface finish cf. DIN EN ISO 1302 (2002-06)

Symbols for groove direction

Representation of groove direction							
Symbol	=	⊥	X	M	C	R	P
Groove direction	parallel to the projection plane	perpendicular to the projection plane	crossed in two angular directions	multi-directional	approximately concentric to the center	approximately radial to the center	non-grooved surface, non-directional or troughs

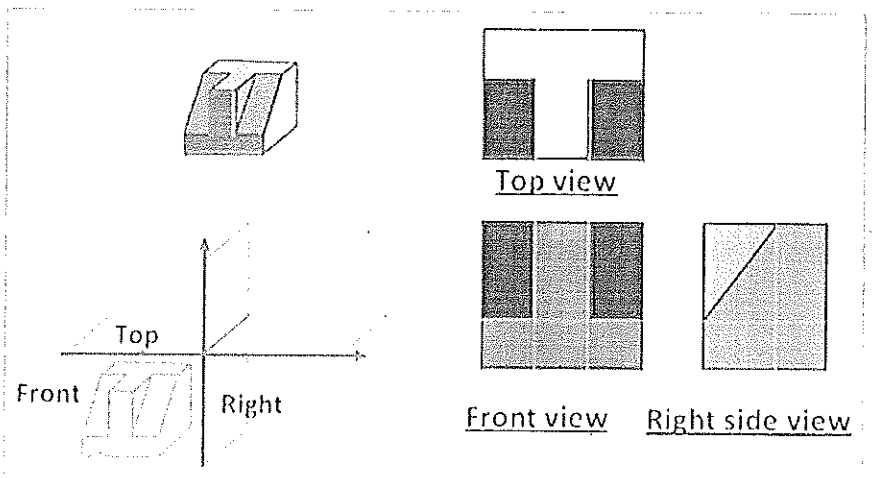
Section – C

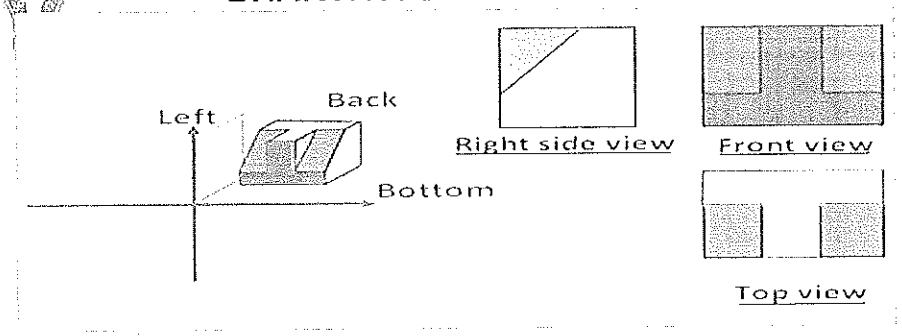
04X06 = 24 Marks

Q15. Differentiate between first angle and third angle projection?

Ans.

First angle projection	Third-angle projection
Object is kept in the first quadrant.	Object is assumed to be kept in the third quadrant.
Object lies between observer and the plane of projection.	Plane of projection lies between the observer and the object.
The plane of projection is assumed to be non-transparent.	The plane of projection is assumed to be transparent.
Front (elevation) view is drawn above the XY line	Front (elevation) view is drawn below the XY line
Top (plan) view is drawn below the XY line	Top (plan) view is drawn above the XY line
Left view is projected on the right plane and vice versa	Left view is projected on the left plane itself.
Followed in India, European countries	Followed in USA





Q16. What is fit? Name types of fit

Ans.

Manufactured parts are required to mate with one another during assembly.

- The relationship between the two mating parts that are to be assembled, that is, the hole and the shaft, with respect to the difference in their dimensions before assembly is called a fit.
- An ideal fit is required for proper functioning of the mating parts. Three basic types of fits can be identified, depending on the actual limits of the hole or shaft:

a. Clearance fit
b. Interference fit
c. Transition fit

Clearance fit: The largest permissible diameter of the shaft is smaller than the diameter of the smallest hole.

- In case of clearance fit, the difference between the sizes is always positive.

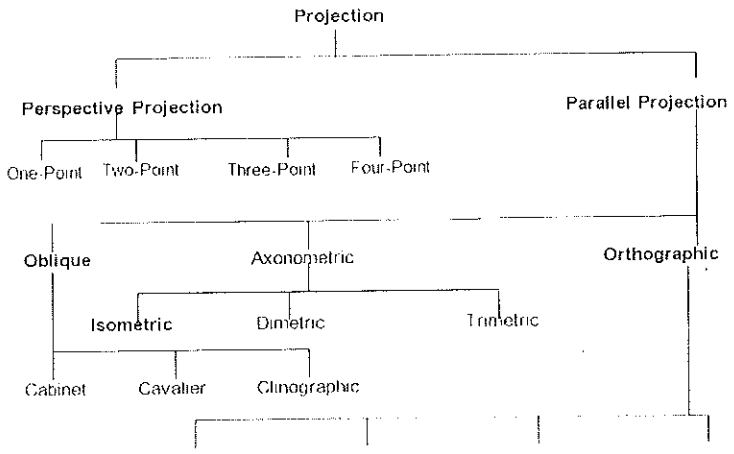
Interference fit: The minimum permissible diameter of the shaft exceeds the maximum allowable diameter of the hole.

- This type of fit always provides interference. Interference fit is a form of a tight fit. Tools are required for the precise assembly of two parts with an interference fit.
- In an interference fit, the difference between the sizes is always negative.

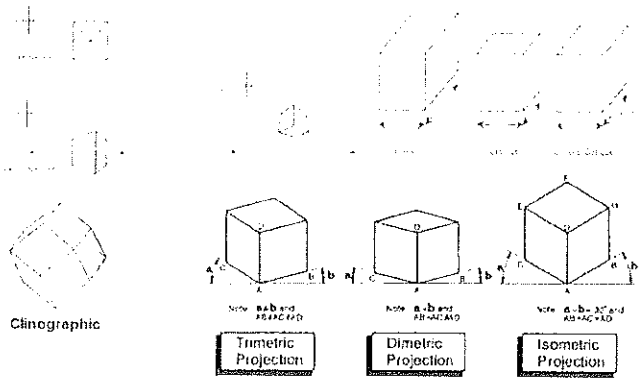
Transition fit: Occurs when two tolerance mating parts are sometimes and interference fit and sometimes clearance fit when assembled.

Q17. Explain projection methods.

Ans.



EXAMPLES



Q18. Explain the types of machine screws

Ans.

SCREWS

- Machine screws are used when a nut cannot be used in the assembly and the component in the assembly has a threaded hole to receive the screws
- Types of machine screws
  - Hexagon head screws
  - Hexagon socket head caps screws
  - Square head and countersunk head screws
  - Set screws
  - Grub screws

HEXAGON HEAD SCREWS

- Hexagon head screws are used when the projection of the screw head will not be an obstruction in the assembly
- They are made of steel and for electrical work they are made of brass

HEXAGON SOCKET HEAD CAP SCREWS

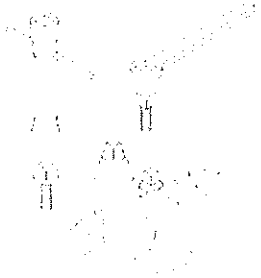
- These are used when the projection of the screw head above the surface is to be avoided
- The Indian standard specification head socket cap screws cover the range from 1.6 mm to 36 mm
- They are made of steel

COUNTER SINK SCREWS

- There are four types of counter-sink head screws in common use
  - Slotted countersink head screws (M1-M20)
  - Cross recessed countersink head screws (M1.6-M10)
  - Slotted raised countersink head screws (M1-M20)
  - Cross recessed, raised countersink head screws (M1.6-M10)
- Countersink screws are capable of aligning the matching component correctly with threaded hole

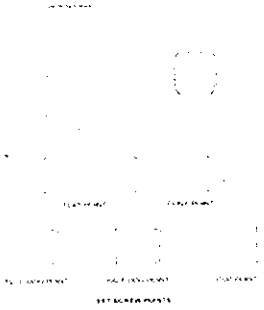
SQUARE HEAD SCREWS

- Square head screws are used in places where there is frequent removal and refitting of the assembly
- These screws are tightened to a higher torque using a wrench
- Square head screws are also available with a collar
- There is a washer at the base which is integral part of the head
- The purpose of collar is to protect the work surface from damages due to constant use of wrenches



SET SCREWS AND GRUB SCREWS

- Hexagonal socket set screws these are headless socket screws available with different points for various functional requirement
- These points either allow to bite into the metal or tighten without damage to work surface
- They are used to fasten pulleys collars etc to shafts
- They are used for higher strength applications where space is limited



SET SCREWS AND GRUB SCREWS

- Grub Screws have similar application as hexagon socket set screws but are used for light holding
- Grub screws are also available with different types of points

Vipin