Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 1st Semester,

1st In-Sem. Examination

Course Code: AUT1101 **Time: 1 Hour**

Course Name: Automotive Power Train Chassis & Suspension **Max. Marks: 20**

Instruction:

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

Section – A

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

1) The inside diameter of cylinder is called .....
   a) Stroke
   b) Radius
   c) Bore
   d) All of the above
2) When piston is at the top, 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) ..... is ratio of total cylinder volume to clearance Volume.
   a) Compression ratio
   b) Air fuel ratio
   c) Gear ratio
   d) Volume ratio
4) The word "Automobile" means:
   a) Auto-drive
   b) Self-Moving
   c) Self-controlling
   d) All of the above
5) Which of the following is not an internal combustion engine?
   a) Petrol engine
   b) Diesel engine
   c) 4 stroke engine
   d) Gas turbine

Section – B

03X02 = 06 Marks

6) Define the term "Automobile".
7) What are the advantages of IC engine over EC engine?
8) Draw a labelled diagram of 4-wheel drive vehicle.

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Section – C 03X03 = 09 Marks

9) Discuss the general service procedures of a four wheeler vehicle.
10) What are the essential safety practices which must be followed in an automobile workshop?
11) Explain the working of 4-stroke diesel engine with the help of a diagram.

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School of Automotive Skills

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3. Answer all question from section C, each question carries three mark.

Section – A

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

1) The inside diameter of cylinder is called .....

   a)
   b) Stroke
   c) Radius
   d) Bore
   e) All of the above

2)

Ans: c)

2 3 When piston is at the top, the volume contained in the cylinder above the top of the piston is called.....

   a)
   b) Swept volume
   c) Clearance volume
   d) Total cylinder volume
   e) None of these

4

Ans: b)

3 5 ..... is ratio of total cylinder volume to clearance Volume.

   a)
   b) Compression ratio
   c) Air fuel ratio
   d) Gear ratio
   e) Volume ratio

6

Ans: a)

4 ~~7~~) The word "Automobile" means:

a)
b) Auto-drive
c) Self-Moving
d) Self-controlling
e) All of the above

Ans: b)

5 ~~8~~) Which of the following is not an internal combustion engine?

a)
b) Petrol engine
c) Diesel engine
d) 4 stroke engine
e) Gas turbine

Ans: d)

Section – B

03X02 = 06 Marks

6 ~~9~~) Define the term "Automobile".

Ans: An automobile is a self-moving vehicle driven by its own motive power. Eg. Car, bus jeep, truck, etc.

7 ~~10~~) What are the advantages of IC engine over EC engine?

Ans. Advantages of Reciprocating internal combustion engines over external combustion engines:

1. Overall all efficiency is high.
2. Greater Mechanical Efficiency.
3. Weight to power ratio is generally low.
4. Generally lower initial cost.
5. Easy starting from cold conditions.

These units are compact and thus require less space

8 ~~11~~) Draw a labelled diagram of 4-wheel drive vehicle.

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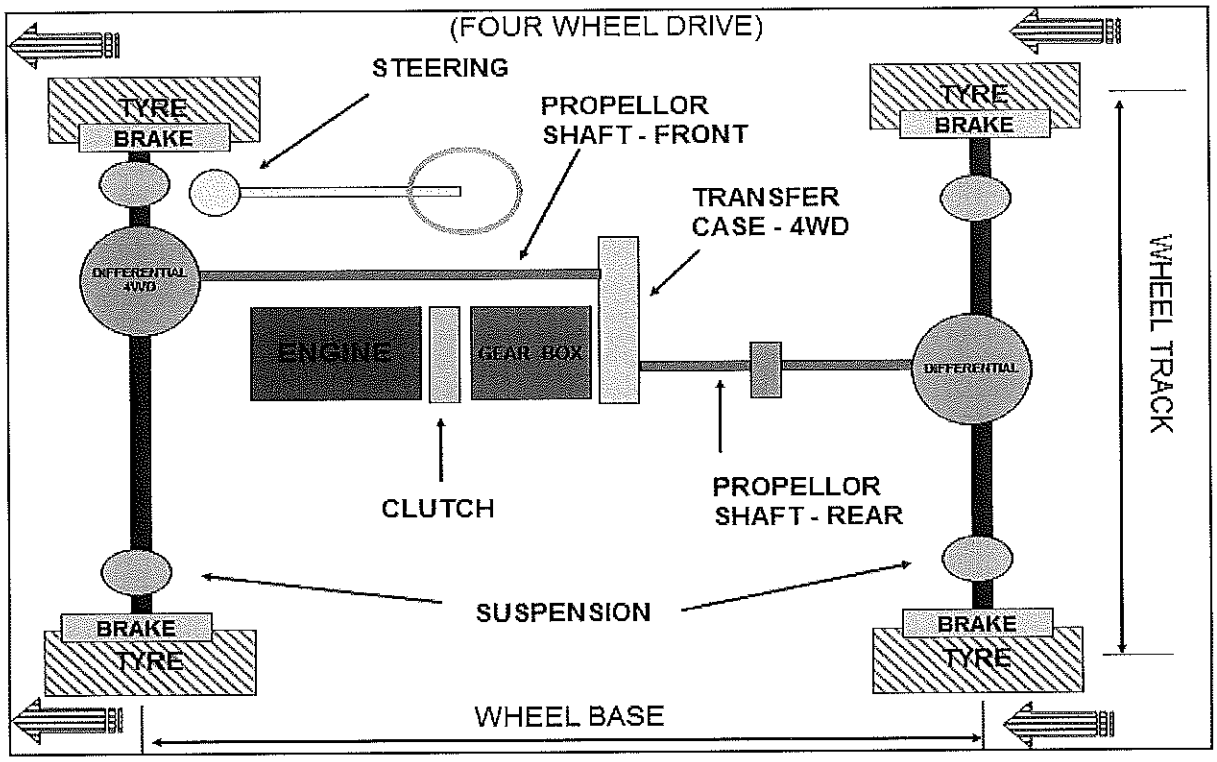
Ans:



Section – C 03X03 = 09 Marks

9 ~~12~~) Discuss general service procedures of a vehicle.

Ans: - The general service includes:

1. Engine oil change
2. Oil filter change
3. Replace the fuel filter
4. Air filter change
5. Check both rear and front brake
6. Check the level of brake and clutch fluid
7. Grease and lubricate components
8. Check the proper operation of all the lights, wiper etc.
9. Check the error code in ECU and take corrective action.
10. Wash the vehicle and clean the interiors.

10 ~~13~~) What are the various safety practices that must be followed in an automobile workshop?

Ans:

The various safety practices are as follows:

- Always wear a safety helmet in the workshop, especially when working under the vehicle.
- Wear cotton hand gloves when working or carrying out repairs or service on a vehicle.
- Wear face masks to cover your nose and mouth.
- Wear safety goggles when working under the vehicle.
- Do not wear rings, watches and loose clothes when working on a vehicle.
- Keep the shop floor clean and tidy.

- Wear safety shoes in the workshop.
- Use specific and tool for a specific job.

11 ~~14~~) Explain the process of 4-stroke diesel engine with the help of a diagram.

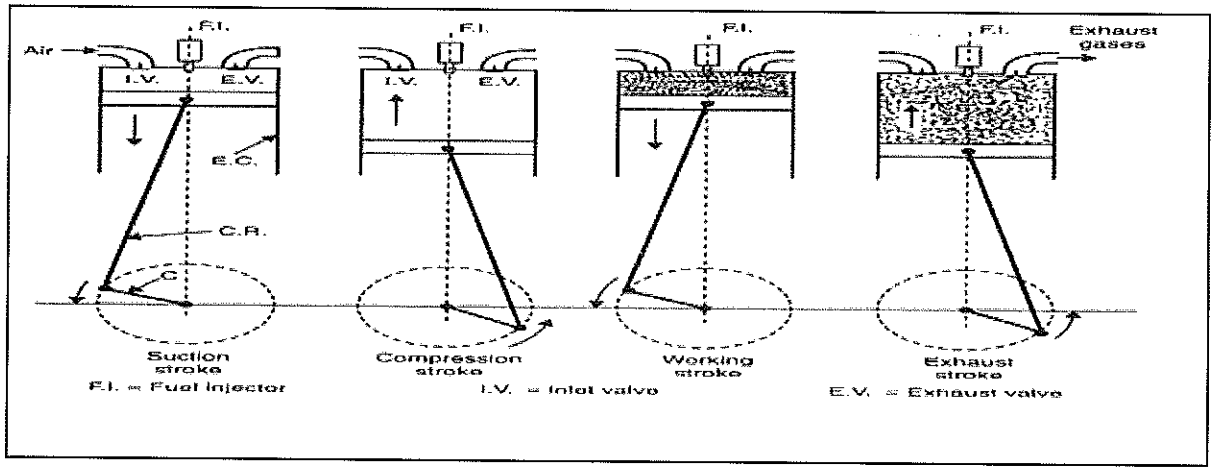
Ans:

SUCTION STROKE: With the movement of the piston from T.D.C. to B.D.C. during this stroke, the inlet valve opens and the air at atmospheric pressure is drawn inside the engine cylinder; the exhaust valve however remains closed. This operation is represented by the line 5-1

COMPRESSION STROKE: The air drawn at atmospheric pressure during the suction stroke is compressed to high pressure and temperature as the piston moves from B.D.C. to T.D.C. Both the inlet and exhaust valves do not open during any part of this stroke. This operation is represented by 1-2

POWER STROKE OR EXPANSION STROKE: As the piston starts moving from T.D.C to B.D.C, the quantity of fuel is injected into the hot compressed air in fine sprays by the fuel injector and it (fuel) starts burning at constant pressure shown by the line 2-3. At the point 3 fuel supply is cut off. The fuel is injected at the end of compression stroke but in actual practice the ignition of the fuel starts before the end of the compression stroke. The hot gases of the cylinder expand adiabatically to point 4. Thus doing work on the piston.

EXHAUST STROKE: The piston moves from the B.D.C. to T.D.C. and the exhaust gases escape to the atmosphere through the exhaust valve. When the piston reaches the T.D.C. the exhaust valve closes and the cycle is completed. This stroke is represented by the line 1-5.



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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 1st Semester,

1st In-Sem. Examination

Course Code: AUT1102 **Time: 1 Hour**

Course Name: Automotive Wheel Care and Steering System **Max. Marks: 20**

Instructions:

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

Section – A

05x01 = 05 Marks

Q 1. The machine which helps the technician to dismount and mount tyres from a wheel is called as:

a. Wheel Alignment.
b. Wheel Balancer.
c. Tyre Changer.
d. None of the above.

Q 2. Which of the following material is used in manufacturing of wheel rims in cars?

a. Plastic.
b. Fiber.
c. Alloys.
d. Copper.

Q.3. Which mechanism is used for bead breaking in tyre changer machine available at BSDU workshop?

a. Electrical.
b. Manual.
c. Pneumatic.
d. None of these.

Q.4. What is the full form of TPMS?

a. Tyre Pressure Monitoring Sensor
b. Tyre Pressure Master Cylinder
c. Tyre Pressure Maintenance Sensor
d. Tyre Puncture Management Sensor

Q.5. What is the full form of OEM?

a. Original Equipment Manager
b. Original Equipment Master
c. Optional Equipment Manufacturer
d. Original Equipment Manufacturer

Section – B

03X02 = 06 Marks

Q 6. What are the roles and responsibilities of a wheel care technician in an automotive workshop?

Q 7. Name any four different types of spanners used in the wheel care section & define them briefly.
Q 8. Write the names of PPEs (Personal Protective Equipment's) required during wheel balancing and tyre changing in the wheel care section?

Section – C

03X03 = 09 Marks

Q 9. Explain the requirement and working of a Wheel Balancer.
Q.10. Explain any six tools used in a wheel care section except screwdrivers with their applications.
Q.11. Explain the various parts of tyre changer with a rough sketch.

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2. Answer all questions from section B, each question carries two marks.
3. Answer all questions from section C, each question carries three marks.

Section – A

05x01 = 05 Marks

Q 1. The machine which helps the technician to distribute the mass equally over the tyre is known as:

a. Wheel Alignment.
b. Wheel Balancer. (Ans.)
c. Tyre Changer.
d. None of the above.

Q 2. During changing the tyre which type of liquid is applied on the tyres:

a. Oil.
b. Diesel.
c. Kerosene.
d. Tyre lube (Ans.)

Q.3. Which mechanism is used for bead breaking in tyre changer machine?

a. Electrical.
b. Manual.
c. Pneumatic. (Ans.)
d. None of these.

Q.4. What is the full form of TWI?

a. Tread wear indicator. (Ans.)
b. Tyre wear indicator.
c. Tread worn indicator.
d. Tyre worn indicator

Q.5. What is the full form of OEM?

a. Original Equipment Manager
b. Original Equipment Master
c. Optional Equipment Manufacturer
d. Original Equipment Manufacturer (Ans.)

Section – B

03X02 = 06 Marks

Q 6. Differentiate between tools and equipment.

Ans.

Sr. No.	Tools	Equipments
1	A tool can be any item that is used to achieve a goal	Equipment usually denotes a set of tools that are used to achieve a specific objective
2	A tool can be non-mechanical device	A equipment is a mechanical device
3	The usage of tools among human beings runs back to millions of years	The use of equipment is more of a recent development.
4	Tools are usually multipurpose.	Equipment is designed for a specific task.

Q 7. Name any four different types of spanners used in the wheel care section & define them briefly.

Ans.

- **Open-end wrench**
- **Combination wrench**
- **Adjustable wrench**
- **Socket wrench**

Q 8. What are the personal protective equipment used in a 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.

Section – C

03X03 = 09 Marks

Q 1. Explain the requirement and working of Tyre Changer.

Ans.

A **tire changer** is a machine used to help tire technicians dismount and mount tires with automobile wheels. After the wheel and tire assembly are removed from the automobile, the tire changer has all the components necessary to remove and replace the tire from the wheel. Different tire changers allow technicians to replace tires on automobiles, motorcycles and heavy-duty trucks.

Q 2. What do you understand by 5S?

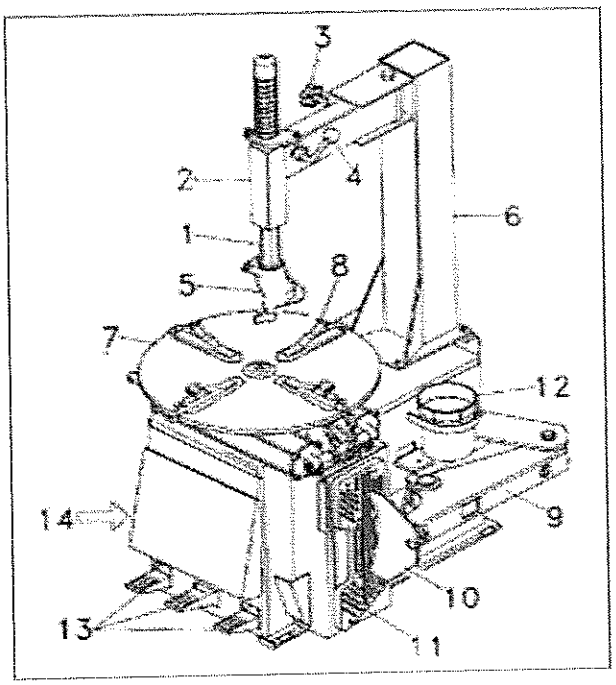
Ans.

5S is a system for organizing spaces so work can be performed efficiently, effectively, and safely. This system focuses on putting everything where it belongs and keeping the workplace clean, which makes it easier for people to do their jobs without wasting time or risking injury.

The term 5S comes from five Japanese words:

- Seiri
- Seiton
- Seiso
- Seiketsu
- Shitsuke

Q.3. Identify the components of tyre changer in the figure given below:



Ans.

1. Vertical slide.
2. Swing arm.
3. Adjustable knob.
4. Lock lever.
5. Mount / demount head.
6. Tower or column.
7. Turntable.
8. Jaw or clamp.
9. Bead breaker arm.
10. Bead breaker blade.
11. Bead breaker pads.
12. Lube pail.
13. Foot pedal controls.
14. Bead seater/ inflator pedal.

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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 1st Semester

1st In-Sem. Examination

Course Code: AUT1103 **Time: 1 Hour**

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

Instruction:

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

Section-A

5x1=5 Marks

Q-1. What is the color code of a warning sign?

a. Blue
b. Green
c. Yellow
d. Red

Q-2. Out of the following options which is not a body panel?

a. Door
b. Fender
c. Wheel
d. Bumper

Q-3. The number of Body Panel in a vehicle are: -

a. 10
b. 20
c. 12
d. 13

Q-4. Out of the following options which one is a safety equipment?

a. Shoes
b. Gloves
c. Goggles
d. All of the above

Q-5. What is the color code of a prohibition sign?

a. Red
b. Yellow
c. Black
d. Blue

Section-B

3x2=6 Marks

Q-6. What are the purpose of Auto body repairer shop in the automotive workshop?

Q-7. What are the role and responsibilities of an Auto body repairer?

Q-8. Write down the full form of SUV, MUV and ATV.

Section-C

3x3=9 Marks

Q-9. Explain the 5S theory.

Q-10. What are the PPE equipments essential required in an Auto body repair shop?

Q-11. Explain any three safety hazard symbols in automotive body workshop with diagram?

Set-A
Answer Key

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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 1st Semester

1st In-Sem. Examination

Course Code: AUT1103 **Time: 1 Hour**

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

Instruction:

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

Section-A

5x1=5 Marks

Ans-1. C) Yellow

Ans-2. C) wheel

Ans-3. D) 13

Ans-4. D) All of the above

Ans-5. A) Red

Section-B

3x2=6 Marks

Q-6. Describe body repair workshop?

Ans.

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

Q-7. Who is an auto body repairer?

Ans.

- An auto body repairer is someone who works in the automotive industry.
- They repair, restore, refinish, and replace vehicle bodies and frames, windshields, and window glass.

Q-8. Write down the full form of SUV, MUV and ATV.

Ans.

1. SUV= Sport Utility Vehicle
2. MUV= Multi Utility Vehicle
3. ATV= All-terrain Vehicle

Section-C

3x3=9 Marks

Q-9. Write down the operations of body repair workshop.

Ans.

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

Q-10. What are the safety equipments? Write down the safety equipments which we use before entering the body repair workshop.

Ans.

Safety Equipments : safety equipment is the protection that is used by workers to avoid injuries, casualties, life threatening situations etc. Different types of safety equipment are used by workers depending upon the nature of risk involved in the work. For example, in a welding operation the dark welding helmets are used as a piece of safety equipment.

Safety equipment used in body repair workshop:

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

Q-11. What are the roles of a technician in body repair workshop?

Ans:

- An auto body technician can repair most damage from everyday vehicle collisions and make vehicles look and drive like new.
- Damage may be minor, such as replacing a cracked windshield, or major, such as replacing an entire door panel.
- They can do all body work.

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School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 1ST Semester,

1st In-Sem. Examination

Course Code: AUT1104 **Time: 1 Hour**

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

Instruction: Attempt all questions.

Section – A

05X01 = 05 Marks

1. Sanding process is required to...
   a. Even the surface
   b. Fill the holes
   c. Both (a) and (b)
   d. None of the above
2. The substance used as an undercoat during painting is...
   a. Primer
   b. Putty
   c. Thinner
   d. None of these
3. Mask and respirator is an PPE which must be used while:
   a. Primer Application
   b. Paint Application
   c. Both A and B
   d. Neither A nor B
4. Paint Booth is used to mix the primer and paint for application on the panel.
   a. True
   b. False
5. All the application work in Automotive Paint Shop including Primer, Paint and Clear Coat is done inside the paint-booth.
   a. True
   b. False

Section – B

03X02 = 06 Marks

6. What are the responsibilities of a paint shop technician?
7. Write the names of six different tools/equipments with their application used in an Automotive Paint Shop.
8. Name six different personal protective equipment with their special feature used in an Automotive Paint Shop.

Section – C

03X03 = 09 Marks

9. Discuss Interior Paint Safety Hazard along with its effect on the health of a paint shop technician.
10. Write about Fire Safety Hazard and the reasons which can cause Fire safety hazards in an Automotive Paint Shop.
11. Discuss the Preventive Measures which can reduce the risks of Hazards in an Automotive Paint Shop.

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Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 1ST Semester,

1st In-Sem. Examination

Course Code: AUT1104 **Time: 1 Hour**

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

Instruction: Attempt all questions.

Section – A

05X01 = 05 Marks

1. Sanding process is required to...
   a. Even the surface
   b. Fill the holes
   c. Both (a) and (b)
   d. None of the above
2. The substance used as an undercoat during painting is...
   a. Primer
   b. Putty
   c. Thinner
   d. None of these
3. Mask and respirator is an PPE which must be used while:
   a. Primer Application
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   c. Both A and B
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4. Paint Booth is used to mix the primer and paint for application on the panel.
   a. True
   b. False
5. All the application work in Automotive Paint Shop including Primer, Paint and Clear Coat is done inside the paint-booth.
   a. True
   b. False

Section – B

03X02 = 06 Marks

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

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

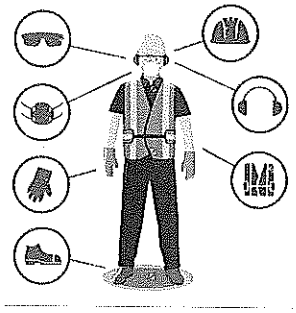
   1. Pre -paint preparation
   2. Priming and painting
   3. Paint inspection
   4. Rectification of defects

   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.

7. Write the names of six different tools/equipments with their application used in an Automotive Paint Shop.
   a. Paint Booth- For providing safe and appropriate environment for paint/primer application
   b. Sanding Machine- Sanding of panel
   c. Vacuum Machine- Sanding dust collection
   d. Paint Mixing Machine- for maintaining paint inventory
   e. Sanding Blocks- for sanding small area and body linings
   f. Spray Guns- for paint/primer application
8. Name six different personal protective equipment with their special feature used in an Automotive Paint Shop.



Section – C

03X03 = 09 Marks

9. Discuss Interior Paint Safety Hazard along with its effect on the health of a paint shop technician.

Interior Painting Safety Hazards:

- Inadequate ventilation is the first and foremost hazard when painting indoors.
- Take care when placing appropriate warning signs for people place them at a level and in a position where the majority of people can see them easily.

The main health effects include:

1. Eye and skin irritation
2. Respiratory tract irritation;
3. Dermatitis/Skin diseases
4. Drowsiness
5. Vomiting

10. Write about Fire Safety Hazard and the reasons which can cause Fire safety hazards in an Automotive Paint Shop.

Fire and explosion hazards

One of the major safety concerns associated with spray application is the combustible flammable vapours and mists. It is important to ensure that all potential sources of ignition have been removed prior to spraying flammable and combustible products.

Reasons:

Open flames (work space heating units)

Cutting and welding torches

Gas fired heaters

Electrical outlets and lighting

Static electricity

Smoking

11. Discuss the Preventive Measures which can reduce the risks of Hazards in an Automotive Paint Shop.

Preventive measures

1. Engineering controls:-
- Use of less hazardous substitutes
- Proper ventilation
- Proper isolation during spray painting

2. Administrative controls:-
- Education and training
- Safe work procedures

3. Personal protective equipments:-
- Respiratory protective equipment
- Eye protection
- Protective clothing

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session 2020-21, Summer Semester

B. Voc. Program, 1st Semester,

1st In-Sem. Examination

Course Code: AUT1105 **Time: 1 Hour**

Course Name: Automotive Electrical Fundamentals & Comfort System

Max. Marks: 20

Instruction:

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

Section – A

05x01 = 05 Marks

Q 1. Which measuring instrument is commonly used in the automotive workshops for auto-electrical measurements?

A. Ohmmeter.
B. Voltmeter.
C. Oscilloscope.
D. Multimeter.

Q 2. Among the below options which material is a bad conductor of electricity?

A. Brass.
B. Glass.
C. Copper.
D. Silver.

Q 3. 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.

Q 4. What is the relationship between resistance and length of wires?

A. If length increases than resistance increases.
B. If length decreases than resistance increases.
C. Both of the above.
D. None of the above.

Q 5. Why 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.

Section – B

03X02 = 06 Marks

Q 6. Differentiate between conductors and insulators.

Q 7. What do you understand by shielding of wires in an automotive electrical?

Q 8. What do you understand by capacitors? Name any four applications of capacitors in an automotive electrical.

Section – C

03X03 = 09 Marks

Q 9. Explain the followings:

a) Wires.

b) Fuses.

c) Relays.

Q 10. Explain open , close and isolated systems.

Q 11. What are the SI units of the following entities?

a) Temperature.

b) Pressure.

c) Heat.

d) Work.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session 2020-21, Summer Semester

B. Voc. Program, 1st Semester,

1st In-Sem. Examination

Course Code: AUT1105

Course Name: Automotive Electrical Fundamentals & Comfort System

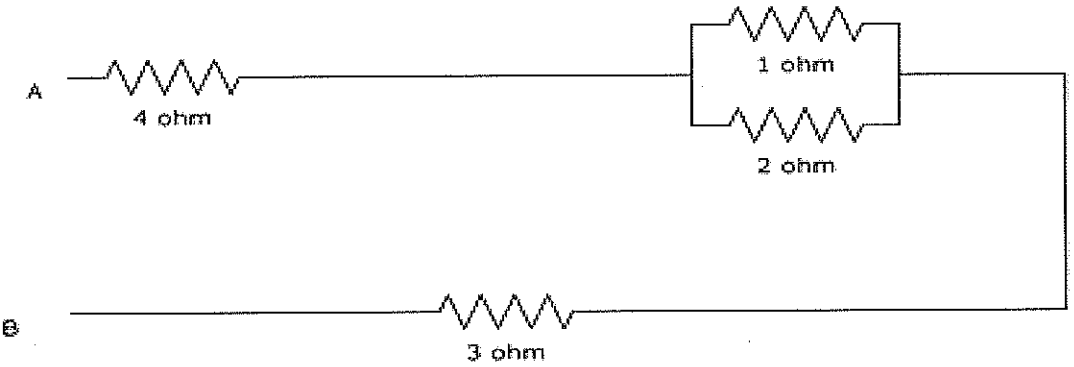
Section – A

05x01 = 05 Marks

Q 1. Which electrical system is used to check the equipment and devices that measure engine and other vehicle variables and parameters and display their status to the driver?

Answer: B. Vehicle Instrumentation System.

Q 2. Calculate the total resistance between the points A and B.



Answer: C. 7.67 ohms.

Q 3. Batteries are generally connected in _____.

Answer: A. Series.

Q 4. In a _____ circuit, the total resistance is smaller than the smallest resistance in the circuit?

Answer: B. Parallel.

Q 5. What is the purpose of a Drain Wire in an electrical cable?

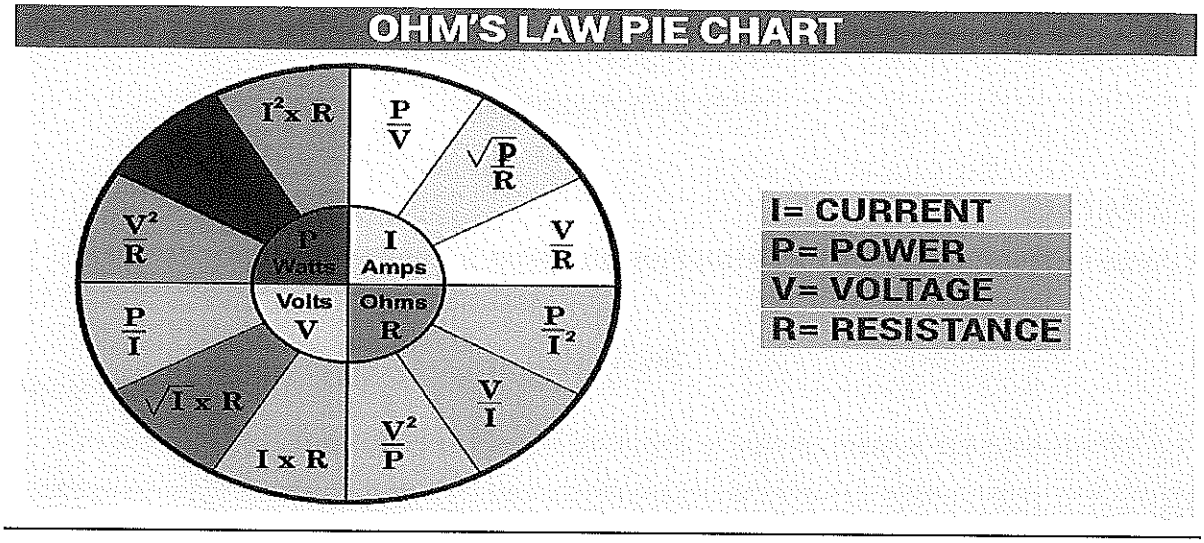
Answer: D. To reduce the magnetic effect of positive and negative wire in a cable.

Section – B

03X02 = 06 Marks

Q 6. What do you mean by Ohm's law? Also draw the Ohm's Law Pie Chart.

Answer:



Ohm's law states that the current through a conductor between two points is directly proportional to the voltage across the two points. Introducing the constant of proportionality, the resistance, one arrives at the usual mathematical equation that describes this relationship:

$$I=V / R$$

Q 7. What do you understand by resistor color code ratings in an automotive electrical? Also name any four types of resistors.

Answer:

All modern fixed value resistors can be classified into four broad groups:

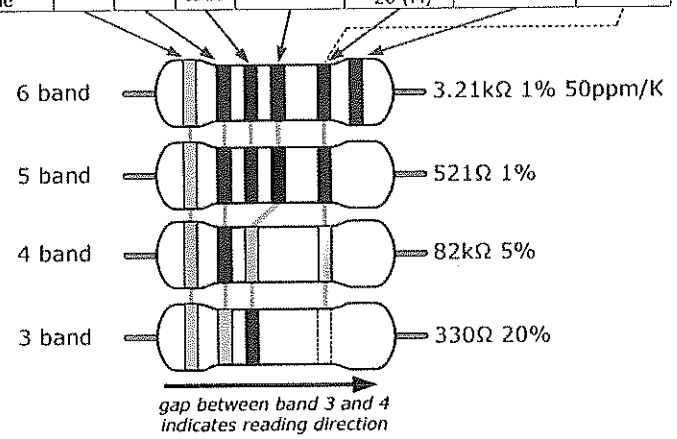
Carbon Composition Resistor – Made of carbon dust or graphite paste, low wattage values.

Film or Cermet Resistor – Made from conductive metal oxide paste, very low wattage values.

Wire-wound Resistor – Metallic bodies for heatsink mounting, very high wattage ratings.

Semiconductor Resistor – High frequency/precision surface mount thin film technology.

	Color	Significant figures			Multiply	Tolerance (%)	Temp. Coeff. (ppm/K)	Fail Rate (%)
Bad	black	0	0	0	x 1		250 (U)	
Beer	brown	1	1	1	x 10	1 (F)	100 (S)	1
Rots	red	2	2	2	x 100	2 (G)	50 (R)	0.1
Our	orange	3	3	3	x 1K		15 (P)	0.01
Young	yellow	4	4	4	x 10K		25 (Q)	0.001
Guts	green	5	5	5	x 100K	0.5 (D)	20 (Z)	
But	blue	6	6	6	x 1M	0.25 (C)	10 (Z)	
Vodka	violet	7	7	7	x 10M	0.1 (B)	5 (M)	
Goes	grey	8	8	8	x 100M	0.05 (A)	1(K)	
Well	white	9	9	9	x 1G			
Get	gold			5th digit only for 5 and 6 bands	x 0.1	5 (J)		
Some	silver				x 0.01	10 (K)		
Now!	none					20 (M)		



Q 8. What do you understand by capacitors? Name any four applications of capacitors in an automotive electrical.

Answer: A capacitor is a device that stores electrical energy in an electric field. It is a passive electronic component with two terminals.

Application of capacitors:

- Energy storage.
- Digital memory.
- Pulsed power and weapons.
- Power conditioning.
- Power factor correction.
- Suppression and coupling.
- Signal coupling.
- Decoupling.
- High-pass and low-pass filters.
- Noise suppression, spikes, and snubbers.
- Motor starters.
- Signal processing.
- Tuned circuits.
- Sensing.
- Oscillators.
- Producing light.

Section – C

03X03 = 09 Marks

Q 9. Explain the followings:

a) Markings on a fuse.

b) Electromechanical relays.

c) Wire stripper.

Answer:

a. Marking on a fuse:
    a. Current rating of the fuse.
    b. Voltage rating of the fuse.
    c. Time-current characteristic; i.e. fuse speed.
    d. Approvals by national and international standards agencies.
    e. Manufacturer/part number/series.
    f. Interrupting rating (Breaking capacity).

b. Electromechanical relays:
    a. General Purpose Relays are electromechanical switches, usually operated by a magnetic coil. General purpose relays operate with AC or DC current, at common voltages such as 12V, 24V, 48V, 120V and 230V, and they can control currents ranging from 2A-30A. These relays are economical, easy to replace and allow a wide range of switch configuration.

c. Wire Stripper:
    a. A wire stripper is a small, hand-held device used to strip the electrical insulation from electric wires.
    b. Types:
    c. Manual.
    d. Compound Automatic.
    e. Laser Wire Stripper.

Q 10. Explain open, closed and isolated systems.

Answer: In thermodynamics, a closed system can exchange energy (as heat or work) but not matter, with its surroundings. An isolated system cannot exchange any heat, work, or matter with the surroundings, while an open system can exchange energy and matter.

Q 11. What are the SI units of the following entities?

a) Temperature.:- Kelvin

b) Pressure.:- Pascal

c) Heat.:- Joule

d) Work.- Joule

Set - A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 1st Semester,

1st In-Sem. Examination

Course Code: AUT1106 **Time: 1 Hour**

Course Name: Automotive Tools & Measurement **Max. Marks: 20**

Instruction: Attempt all Questions.

Section – A

05X01 = 05 Marks

Q-1. The least count defines the.....

a. Smallest unit we can measure
c. Smallest length
b. Smallest dimension
d. None of these

Q-2. Which type of measurement does not provide numerical values?

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

Q-3. In engineering drawing second & fourth angle projections are not used because of:

a. Overlapping
c. Lacking
b. Complications
d. None of the above

Q-4. Which one of the following ratios represents the reducing scale?

a. 1:1
c. 2:1
b. 1:2
d. 10:2

Q-5. Which value can be the reading of an instrument having least count = 20μm ?

a. 20.05
c. 20.06
b. 20.062
d. 20.006

Section – B

03X02 = 06 Marks

Q-6. Mention the parameters required during selection of measuring tools.

Q-7. Write at least 4 differences between tools and equipments.

Q-8. What is meant by fit? Name different types of fits.

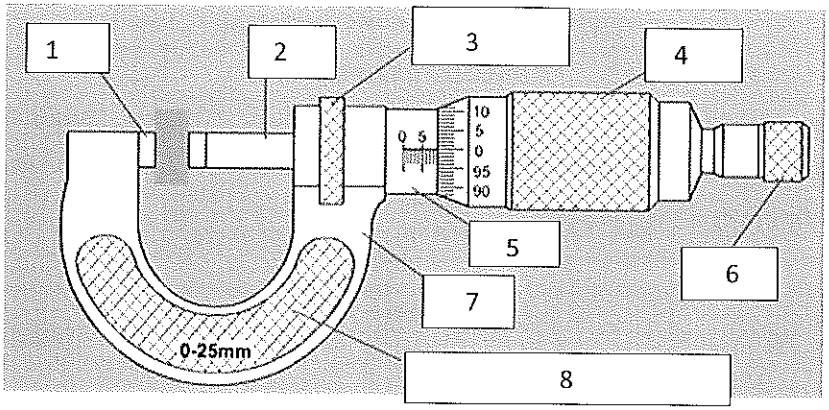
Section – C

03X03 = 09 Marks

Q-9. Write a short note on spanners.

Q-10. Define calibration. Write down different types of errors associated with Vernier caliper?

Q-11. Name the different parts of the following measuring instrument:



Solution Set-A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 1st Semester,

1st In-Sem. Examination

Course Code: AUT1106 **Time: 1 Hour**

Course Name: Automotive Tools & Measurement **Max. Marks: 20**

Instruction: Attempt all Questions.

Section – A

05X01 = 05 Marks

Q-1. The least count defines the.....

a. **Smallest unit we can measure**
c. Smallest length
b. Smallest dimension
d. None of these

Q-2. Which type of measurement does not provide numerical values?

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

Q-3. In engineering drawing second & fourth angle projections are not used because of:

a. **Overlapping**
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b. Complications
d. None of the above

Q-4. Which one of the following ratios represents the reducing scale?

a. 1:1
c. 2:1
b. **1:2**
d. 10:2

Q-5. Which value can be the reading of an instrument having least count = 20μm ?

a. 20.05
c. **20.06**
b. 20.062
d. 20.006

Section – B

03X02 = 06 Marks

Q-6. Mention the parameters required during selection of measuring tools.

Ans:

1. Range of measuring instrument.
2. Type of measurement linear or circular.
3. Least count of instrument.

Q-7. Write at least 4 differences between tools and equipment's.

Ans: **Tools** that are used in particular fields or activities may have different designations such as "instrument", "utensil", "implement", "machine", "device," or "apparatus". The set of **tools** needed to achieve a goal is "**equipment**". The knowledge of constructing, obtaining and using **tools** is technology.

Q-8. What is meant by fit? Name different types of fits.

Ans:

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**

Section – C

03X03 = 09 Marks

Q-9. Write a short note on spanners.

Ans:

Spanners are used for operating:

- Threaded Fasteners
- Bolts
- Nuts

- Spanners are made with jaws or opening that fit square or hexagonal nuts and bolts and screw heads.
- They are made of High Tensile or alloy steel
- They are drop forged and heat treated for strength
- They are given a smooth surface finish for easy gripping

The basic types of spanners are:

- Open end spanners
- Tube or tubular box spanners
- Socket Spanners
- Ring Spanners

- The correct spanner to use is the one that fits exactly and allows room for use
- They should also permit the job to be done in shorter time

Q-10. Define calibration. Write down different types of errors associated with Vernier caliper?

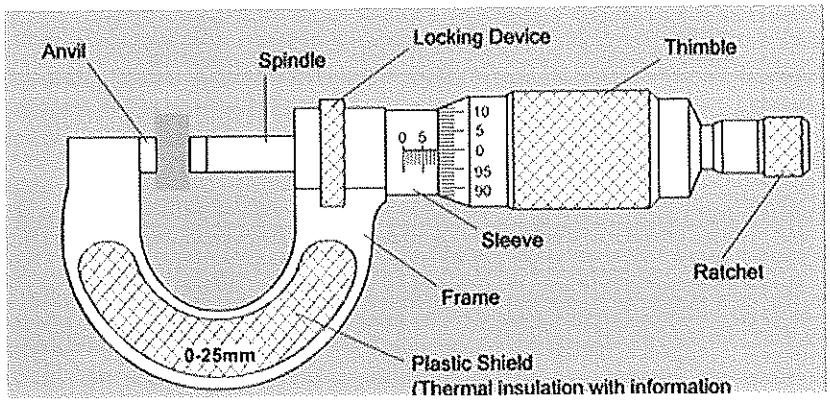
Ans:

Calibration is the process of configuring an instrument to provide a result for a sample within an acceptable range.

Errors of Vernier caliper

1. Parallax error
2. Tilt error
3. Cocking
4. Dirt and burrs on the work piece
5. Dirt on measuring instrument

Q-11. Name the different parts of the following measuring instrument.



Set-B

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 1st Semester,

1st In-Sem. Examination

Course Code: AUT1110 **Time: 1 Hour**

Course Name: Basics of Automobiles **Max. Marks: 20**

Instruction:

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

Section – A

05x01 = 05 Marks

Q 1. Which type of drive is used in heavy commercial vehicles?

A. Front wheel drive.
B. Rear wheel drive.
C. All-wheel drive.
D. Single wheel drive.

Q 2. The function of propeller shaft in an automobile is to:

A. Generate the mechanical power.
B. Transmit the mechanical power.
C. Generate the electrical power.
D. Transmit the electrical power.

Q 3. The torque and speed are varied by using:

A. Gearbox.
B. Clutch.
C. Engine.
D. Accelerator.

Q 4. Engine and gearbox are part of:

A. Automotive electronics.
B. Automotive electrical.
C. Automotive powertrain.
D. Automotive safety.

Q 5. While performing painting, which personal protective equipment/s is/are necessary?

A. Safety goggles.

B. Respiratory mask.

C. Safety shoes.

D. All of the above.

Section – B

03X02 = 06 Marks

Q 6. What is the definition of an automobile? Is bicycle an automobile? If yes/no, Why?

Q 7. Explain the front wheel drive with drawing.

Q 8. List out the various systems of automobile.

Section – C

03X03 = 09 Marks

Q 9. Discuss the responsibilities of an automotive technician?

Q 10. Explain the components of an automotive powertrain and explain any one.

Q 11. Explain the necessity of using safety equipments.

Solution Set-B

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 1st Semester,

1st In-Sem. Examination

Course Code: AUT1110 **Time: 1 Hour**

Course Name: Basics of Automobiles **Max. Marks: 20**

Instruction:

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

Section – A

05x01 = 05 Marks

Q 1. Which type of drive is used in heavy commercial vehicles?

A. Front wheel drive.
B. Rear wheel drive.
C. All-wheel drive.
D. Single wheel drive.

Answer: B

Q 2. The function of propeller shaft in an automobile is to:

A. Generate the mechanical power.
B. Transmit the mechanical power.
C. Generate the electrical power.
D. Transmit the electrical power.

Answer: B

Q 3. The torque and speed are varied by using:

A. Gearbox.
B. Clutch.
C. Engine.
D. Accelerator.

Answer: A

Q 4. Engine and gearbox are part of:

A. Automotive electronics.
B. Automotive electrical.
C. Automotive powertrain.

D. Automotive safety.

Answer: C

Q 5. While performing painting, which personal protective equipment/s is/are necessary?

A. Safety goggles.

B. Respiratory mask.

C. Safety shoes.

D. All of the above.

Answer: D

Section – B

03X02 = 06 Marks

Q 6. What is the definition of an automobile? Is bicycle an automobile? If yes/no, Why?

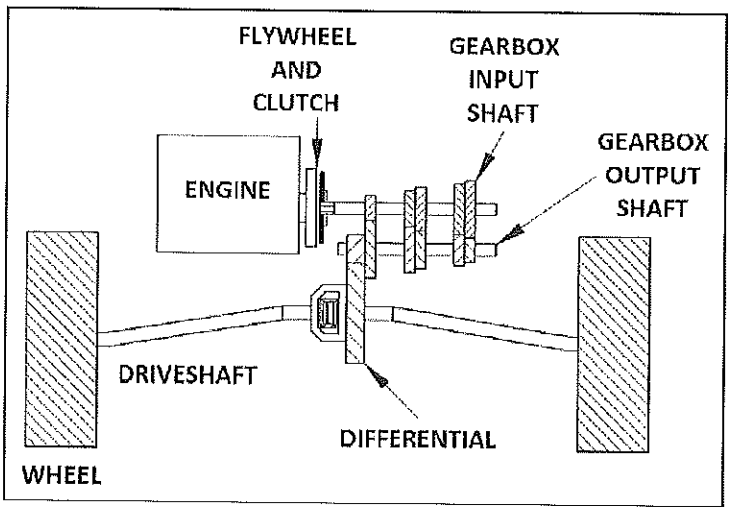
Answer:

An automobile is defined as a wheeled vehicle driven by its own motive power unit that runs on ground and is used for transporting passengers or goods.

No, bicycle is not an automobile. Because it needs human power through paddling for mobility.

Q 7. Explain the front wheel drive with drawing.

Front-wheel drive (FWD) is a form of engine and transmission layout used in motor vehicles, where the engine drives the front wheels only.



Q 8. List out the various systems of automobile.

1. Transmission system
2. Electrical system
3. Safety system
4. Braking system
5. Air Conditioning system
6. Battery charging system
7. Steering system
8. Suspension system

Section – C

03X03 = 09 Marks

Q 9. Discuss the responsibilities of an automotive technician?

1. Perform routine automotive maintenance tasks, including oil changes, tire rotations, transmission flushes, air conditioner re-charges, front-end alignments, battery installations and headlight/taillight installations
2. Inspect vehicles according to the state's requirements for emissions and safety
3. Conduct necessary repairs and take vehicles for test drives to verify soundness
4. Conduct extensive diagnostic procedures to determine the sources of customers' problems and provide accurate repair recommendations

Q 10. Write the components of automotive powertrain and explain any one.

1) Engine
2) Clutch
3) Gearbox
4) Propeller shaft
5) Universal joint
6) Differential
7) Drive Axle

A clutch is a mechanical device which engages and disengages power transmission especially from driving shaft to drive shaft. In the simplest application, clutches connect and disconnect two rotating shafts (drive shafts or line shafts). In these devices, one shaft is typically attached to an engine or other power unit (the driving member) while the other shaft (the driven member) provides output power for work. While typically the motions involved are rotary, linear clutches are also possible.

Q 11. Explain the necessity of using safety equipments.

Working on vehicles can be a fun, exciting, and rewarding career. However, repair shop owners and their staff need to ensure the proper safety precautions and rules are implemented and followed at all times. Safety measures help protect employees from accidental injuries to themselves, their co-workers, customers, and the vehicles they are repairing.

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Set-A

School of Automotive Skills

Session: 2020-21 (Summer Semester)

M. Voc. Program, 1ST Semester,

1st In-Sem. Examination

Course Code: AUT2104 **Time: 1 Hour**

Course Name: Automotive Paint Technology **Max. Marks: 20**

Instructions: Attempt All Questions

Section – A

05X01 = 05 Marks

1. Choose the meaning of HVLP
    a. Heavy volume light pressure
    b. High volume low pressure
    c. High value low paints
    d. Heavy volume low paints
2. What do we mean by "VALUE"?
    a. The Lightness & darkness of the color
    b. The colour direction
    c. Vividness of the color
    d. Coarse of metallic
3. What do we mean by "CHROMA"?
    a. The brightness & Dullness of the color
    b. The colour direction
    c. Vividness of the color
    d. Coarse of metallic
4. What do we mean by "HUE"?
    a. The brightness & Dullness of the color
    b. The colour direction
    c. Vividness of the color
    d. Coarse of metallic
5. When light reflects on the color, it sometimes seems to be a different color under different light sources. What is this phenomenon called?
    a. Color dimension
    b. Spectral simulations
    c. Metamerism
    d. Luminosity of color

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Section – B

03X02 = 06 Marks

6. Define color in context with paint technology.
7. What are the main properties of a color in paint technology?
8. Name different types of colors used in Automotive Painting.

Section – C

03X03 = 09 Marks

9. Describe the process of colour development in automotive paint technology.
10. Explain the different methods for evaluation of a colour panel.
11. Describe the following paint defects with their causes and prevention:
    a. Mottle
    b. Orange Peel

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Sol-Set-A

School of Automotive Skills

First Semester, 1st In-Sem. Examination

M. Voc. Program, Summer Semester (2020-21)

Course Code: AUT2104 **Time: 1 Hour**

Course Name: Automotive Paint Technology **Max. Marks: 20**

Instruction: Attempt all questions.

Section – A

05X01 = 05 Marks

1. Choose the meaning of HVLP
   a. Heavy volume light pressure
   b. High volume low pressure
   c. High value low paints
   d. Heavy volume low paints
2. What do we mean with "VALUE"?
   a. The Lightness & darkness of the color
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   c. Vividness of the color
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3. What do we mean with "CHROMA"?
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5. When light reflects on the color, it sometimes seems to be a different color under different light sources. What is this phenomenon called?
   a. Color dimension
   b. Spectral simulations
   c. Metamerism
   d. Luminosity of color

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Section – B

03X02 = 06 Marks

6. Define color in context with paint technology.
   Color is an individual and subjective observation. The reflected part of the light spectrum on a certain material, observed by the human eye.

7. What are the main properties of a color in paint technology?
   Hue, Chroma, Value, Vividness, color space

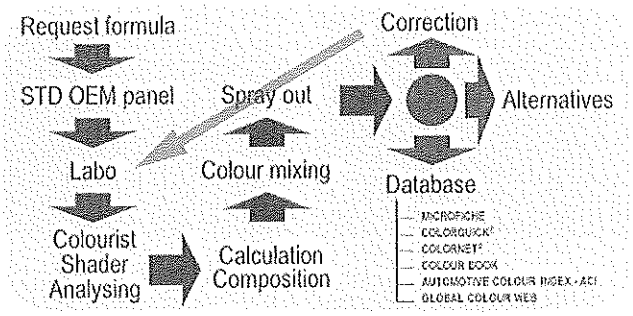
8. Name different types of colors used in Automotive Painting.
   Solid Colours- Metallic, Pearl/Mica, Chromalusion

Section – C

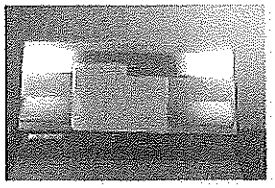
03X03 = 09 Marks

9. Describe the process of colour development in automotive paint technology.

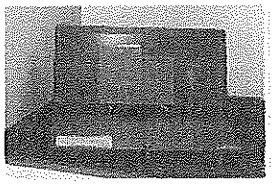
Colour development process



The OEM standard panel is compared to spray out in a light booth

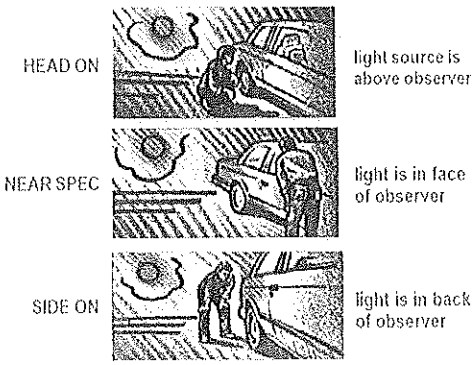


- D65 daylight
  - A-light (artificial light)
  - Sodium light



10. Explain the different methods for evaluation of a colour panel.

How to observe colour: viewing under different angles



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11. Describe the following paint defects with their causes and prevention:

a. Mottle: Mottle occurs when metallic paint is applied excessively wet and color pigments separate from the metallic flakes. The separation of pigments creates darker "rings" of color that deviate from the overall color; metallic flake forms light regions in the centers of the rings.

b. Orange Peel: Orange peel results when the freshly applied paint film does not flow out smoothly. The causes of poor flow-out are usually one of the following:

Excessively Dry Spray

Poorly atomized spray

Overly thin coatings

Rough substrates

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Set -A

School of Automotive Skills

Session: 2020-21 (Summer Semester)

M. Voc. Program, 1ST Semester,

1st In-Sem. Examination

Course Code: AUT2105 **Time: 1 Hour**

Course Name: Automotive Electricals **Max. Marks: 20**

Instructions: Attempt All Questions

Section – A

05X01 = 05 Marks

1. What is the task of a relay?
    a. To give more power to the appliance
    b. The relay replaces a switch
    c. The relay replaces a fuse
    d. A large operating current can be switched with a small control current
2. What is the task of a transistor?
    a. Amplifying a very small control current
    b. Reduce the resistance in a circuit
    c. Protection of a circuit
    d. None of the above
3. What is "specific electrical resistance"?
    a. The resistance of a conductor of 1 mm^2 cross-sectional area and 1 m in length
    b. The resistance of an electrical component in relation to its size
    c. The resistance of a conductor to a high temperature
    d. None of the above
4. What is the main characteristic of a semiconductor?
    a. Becomes a conductor under specific conditions
    b. Can be used as a resistor
    c. Has a lower resistance than a normal conductor
    d. None of the above
5. To measure a voltage on an appliance, a voltmeter must be installed in the circuit
    a. Parallel to the circuit
    b. In series to the appliance
    c. Parallel to the appliance
    d. Directly behind the appliance

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Section – B

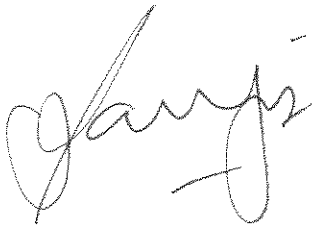
03X02 = 06 Marks

1. What is the function of a free-wheeling diode or a resistor in a relay?
2. Draw a schematic diagram of a relay and explain it's working.
3. Name the four possible types of electric motor. Which two of these can be used as starter motor in an Automotive.

Section – C

03X03 = 09 Marks

4. Explain the working principle of an alternator in an automotive to charge the battery.
5. Explain the process of testing a battery using a multimeter.
6. Explain the operations that take place in the electrical circuit when the ignition of a car is turned on, also mention each major components.



Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY Sol. Set - A

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 1ST Semester,

1st In-Sem. Examination

Course Code: AUT2105 **Time: 1 Hour**

Course Name: Automotive Electricals **Max. Marks: 20**

Instructions: Attempt All Questions

Section – A

05X01 = 05 Marks

1. What is the task of a relay?
   a. To give more power to the appliance
   b. The relay replaces a switch
   c. The relay replaces a fuse
   d. A large operating current can be switched with a small control current
2. What is the task of a transistor?
   a. Amplifying a very small control current
   b. Reduce the resistance in a circuit
   c. Protection of a circuit
   d. None of the above
3. What is "specific electrical resistance"?
   a. The resistance of a conductor of 1 mm2 cross-sectional area and 1 m in length
   b. The resistance of an electrical component in relation to its size
   c. The resistance of a conductor to a high temperature
   d. None of the above
4. What is the main characteristic of a semiconductor?
   a. Becomes a conductor under specific conditions
   b. Can be used as a resistor
   c. Has a lower resistance than a normal conductor
   d. None of the above
5. To measure a voltage on an appliance, a voltmeter must be installed in the circuit
   a. Parallel to the circuit
   b. In series to the appliance
   c. Parallel to the appliance
   d. Directly behind the appliance

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Section – B

03X02 = 06 Marks

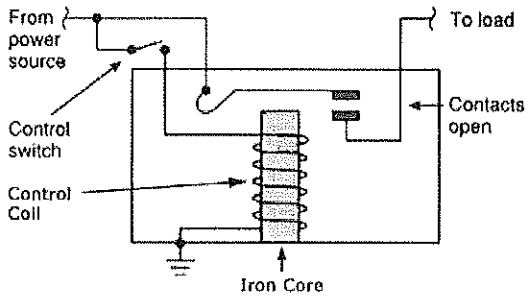
6. What is the function f a free-wheeling diode or a resistor in a relays?

   1 The roller freewheel creates a frictional connection between the armature shaft and pinion.

   2 When the internal combustion engine drives the pinion (starter), it interrupts the connection between the armature shaft and the pinion.

7. Draw a schematic diagram of a relay and explain it's working.

   Relays involve two circuits: the energizing circuit and the contact circuit. The coil is on the energizing side; and the relays contacts are on the contact side. When a relays coil is energized, current flow through the coil creates a magnetic field. Whether in a DC unit where the polarity is fixed, or in an AC unit where the polarity changes 120 times per second, the basic function remains the same: the magnetic coil attracts a ferrous plate, which is part of the armature. One end of the armature is attached to the metal frame, which is formed so that the armature can pivot, while the other end opens and closes the contacts.



8. Name the four possible types of electric motor. Which two of these can be used as starter motor in an Automotive.

   • Shunt motor, exciter winding connected in parallel
   • Permanent magnet motor, stator Permanent magnet
   • Series motors, main motor, connected in series with Exciter winding
   • Double-wound motors, series and parallel excitation winding

   Permanently excited motor:

   Lower torque than the series engine, very stable Speed (field not voltage-dependent)

   Serial motor:

   High torque at standstill (breakaway torque).

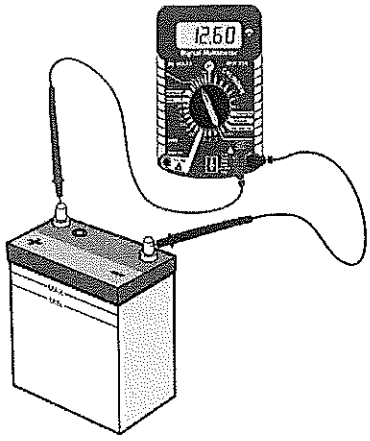
   Fast turning up

Section – C

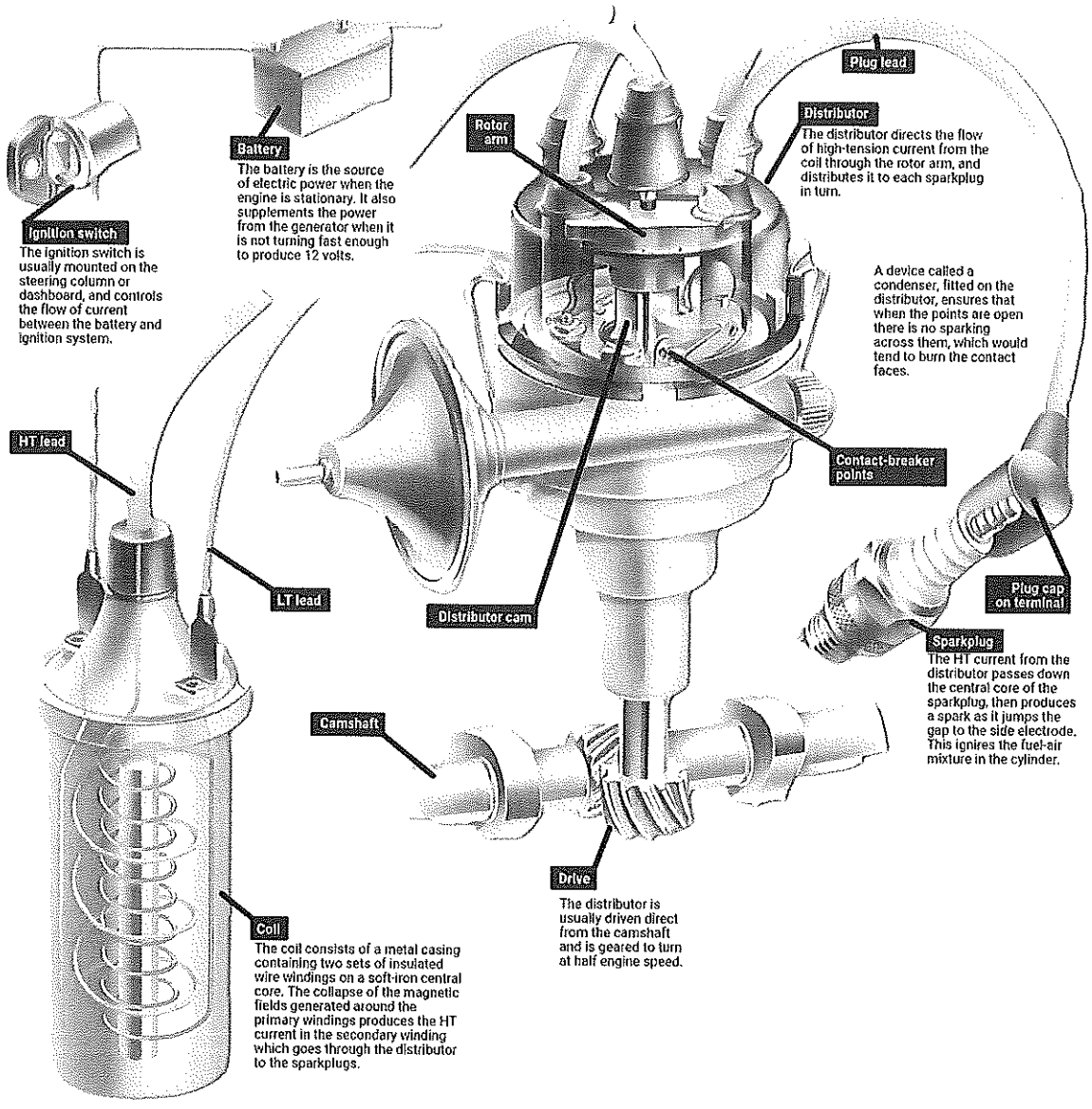
03X03 = 09 Marks

9. Explain the working principle of an alternator in an automotive to charge the battery.
   The alternator uses the principle of electromagnetism to produce current. The way this works is simple. If you take a strong magnet and pass it across a wire, that wire will generate a small voltage. Take that same wire and loop it many times, than if you pass the same magnet across the bundle of loops, you create a more sizable voltage in that wire.
10. Explain the process of testing a battery using a multimeter.
    Please remember that the connection of the multimeter to the circuit depends on the intended type of measurement. Always follow the instructions given in the user manual, when using the multimeter.

- Select the type of measurement before using the multimeter i.e. volts, amps or ohms.
- When measuring volts and amps, care must be taken to check whether the supply is AC or DC. Most automotive electric circuits have a DC power supply. However, some sensors give AC voltages output E.g. Vehicle Speed Sensor
- After selecting the type of measurement select the measuring range.
- Care must be taken to select a range large enough to display the quantity being measured. **If the range selected is too small, the multimeter can get damaged.**
- In case of doubt, the largest possible range should be selected initially.
- After finding the measurement range a smaller range can then be selected
- To measure voltage the multimeter is always connected in parallel to the voltage source or to the component across which voltage is to be measured.
- E.g. if the voltmeter is connected to a fully charged battery, it displays approximately 12.6V.
- Connect positive terminal of the multimeter to the positive terminal of the voltage source & negative terminal of the multimeter to the negative terminal of the voltage source.



11. Explain the operations that take place in the electrical circuit when the ignition of a car is turned on, also mention each major components.



BHARTIYA SKILL DEVELOPMENT UNIVERSITY

SET-A

Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Summer Semester)

M. Voc. Program, 2nd Semester,

1st In-Sem. Examination

Course Code: AUT2107 **Time: 1 Hour**

Course Name: Automotive Safety and Comfort System **Max. Marks: 20**

Section – A

05X01 = 05 Marks

1. One tonne of refrigeration is approximately equal to
   a. 3.5 kJ / min
   b. 3.5 W
   c. 211 kW
   d. 211 kJ / min
2. In automotive refrigeration system oil separator if fitted in between
   a. Condenser and evaporator
   b. On the suction line
   c. Compressor and condenser
   d. at the receiver outlet
3. The function of anti-lock brake system is that is
   a. Reduces the stopping distance
   b. Minimizes the brake fade
   c. Maintains directional control during braking by preventing the wheels from locking
   d. Prevents nose dives during braking and thereby postpones locking of the wheels
4. Seat belts reduce your risk of dying in a crash by:
   a. 20%
   b. 30%
   c. 40%
   d. 50%
5. **The heart of hydraulic brake system is:**
   a. Wheel cylinder
   b. Master cylinder
   c. Adjuster
   d. Brake pedal

Section – B

03X02 = 06 Marks

1. Discuss the properties of refrigerant that can be used in automotive refrigeration systems.
2. Explain the working of collision warning system.
3. Discuss automatic seat belt tightener system.

Section – C

03X03 = 09 Marks

1. Draw VCRS cycle and explain its working.
2. Explain the working of expansion valve used in the refrigeration cycle of 4 wheelers.
3. Explain the working of ABS with a schematic diagram and discuss its advantages.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY SET A Soln

Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Summer Semester)

M. Voc. Program, 2nd Semester,

1st In-Sem. Examination

Course Code: AUT2107 **Time: 1 Hour**

Course Name: Automotive Safety and Comfort System **Max. Marks: 20**

Section – A

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   c. 40%
   d. 50% (Ans.)
5. **The heart of hydraulic brake system is:**
   a. Wheel cylinder
   b. Master cylinder (Ans.)
   c. Adjuster
   d. Brake pedal

Section – B

03X02 = 06 Marks

1. Discuss the properties of refrigerant that can be used in automotive refrigeration systems.

Ans.

Physical Properties of Refrigerants

1. Low Freezing Point
2. Low Condensing Pressure
3. High Evaporator Pressure
4. High Critical Pressure
5. High Vapor Density
6. High Dielectric strength
7. High Latent Heat of Vaporization
8. High Heat Transfer Coefficient

Chemical Properties

1. Toxicity
2. Oil Solubility

3. Low Water Solubility
4. Reactivity

2. Explain the working of collision warning system.

Ans.

A collision avoidance system (CAS), also known as a pre-crash system, forward collision warning system, or collision mitigation system, is a motorcar safety system designed to prevent or reduce the severity of a collision. In its basic form, a forward collision warning system monitors a vehicle's speed, the speed of the vehicle in front of it, and the distance between the vehicles, so that it can provide a warning to the driver if the vehicles get too close, potentially helping to avoid a crash. Various technologies and sensors that are used include radar (all-weather) and sometimes laser (LIDAR) and cameras (employing image recognition) to detect an imminent crash. GPS sensors can detect fixed dangers such as approaching stop signs through a location database. Pedestrian detection can also be a feature of these types of systems.

Collision avoidance systems range from widespread systems mandatory in some countries, such as Autonomous Emergency Braking (AEB) in the EU, agreements between car makers and safety officials to make crash avoidance systems eventually standard, such as in the United States, to research projects including some manufacturer specific devices.

Advanced emergency braking system (AEBS) as defined by UN ECE regulation 131 is considered as: a system which can automatically detect a potential forward collision and activate the vehicle braking system to decelerate the vehicle with the purpose of avoiding or mitigating a collision. UN ECE regulation 152 says deceleration can be 5 metres per second squared.

Once an impending collision is detected, these systems provide a warning to the driver. When the collision becomes imminent, they can take action autonomously without any driver input (by braking or steering or both). Collision avoidance by braking is appropriate at low vehicle speeds (e.g. below 50 km/h (31 mph)), while collision avoidance by steering may be more appropriate at higher vehicle speeds if lanes are clear. Cars with collision avoidance may also be equipped with Adaptive Cruise Control, using the same forward-looking sensors.

AEB differs from Forward Collision Warning: FCW alerts the driver with a warning but does not by itself brake the vehicle.

According to Euro NCAP, AEB has three characteristics:

- Autonomous: the system acts independently of the driver to avoid or mitigate the accident.
- Emergency: the system will intervene only in a critical situation.
- Braking: the system tries to avoid the accident by applying the brakes.

Time-to-collision could be a way to choose which avoidance method (braking or steering) is most appropriate.

Collision avoidance system by steering is a new concept. It is considered by some research projects. Collision avoidance system by steering has some limitations: over-dependence on lane markings, sensor limitations, and interaction between driver and system.

3. Discuss automatic seat belt tightener system.

Ans.

A seat belt system of the conventional three point restraint type includes an electric motor which replaces the usual rewind spring on the belt retractor. When the seat belt is buckled up, the motor is set into operation and pulls the shoulder belt up into engagement with the body of the occupant in the seat, and then is pulsed backward to provide safe tensionless comfort in which the seat belt is located close to the body of the person being restrained but safely spaced away from the body of the occupant. The cycle of tightening of the belt and then releasing it by a predetermined short distance to provide the tensionless comfort position is repeated whenever the occupant either closes the seat belt buckle, shifts the position of the seat by operating the seat release or seat

reclining levers, or leans forward beyond the tensionless range, thereby applying tension to the seat belt. The motor may be pulsed backward by a capacitor, or other means in combination with a switching circuit which applies a reverse pulse from such capacitor or other means to the motor, following tightening up of the belt. The system includes a seat sensor means, a belt tension sensor means, a vehicle speed sensor means for causing re-check of belt tension, and a system operation signal light.

Section – C

03X03 = 09 Marks

1. Dram VCRS cycle and explain its working.

Ans.

The **Vapor Compression Refrigeration Cycle involves four components:** compressor, condenser, expansion valve/throttle valve and evaporator.

It is a compression process, whose aim is to raise the refrigerant pressure, as it flows from an evaporator. The high-pressure refrigerant flows through a condenser/heat exchanger before attaining the initial low pressure and going back to the evaporator. A more detailed explanation of the steps is as explained below.

STEP 1: COMPRESSION

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

STEP 2: CONDENSATION

The condenser is essentially a heat exchanger. **Heat is transferred from the refrigerant to a flow of water.** This water goes to a cooling tower for cooling in the case of water-cooled condensation. Note that seawater and air-cooling methods may also play this role. As the refrigerant flows through the condenser, it is in a constant pressure. One cannot afford to ignore condenser safety and performance. Specifically, pressure control is paramount for safety and efficiency reasons. There are several pressure-controlling devices to take care of this requirement

STEP 3: THROTTLING AND EXPANSION

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

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

STEP 4: EVAPORATION

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

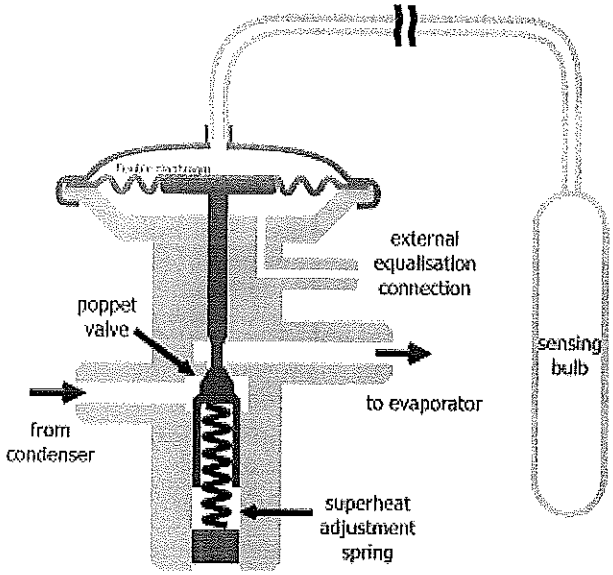
2. Explain the working of expansion valve used in the refrigeration cycle of 4 wheelers.

Ans.

A thermal expansion valve or thermostatic expansion valve (often abbreviated as TEV, TXV, or TX valve) is a component in refrigeration and air conditioning systems that

controls the amount of refrigerant released into the evaporator and is intended to regulate the superheat of the vapor leaving the evaporator. Although often described as a "thermostatic" valve, an expansion valve does not regulate temperature, the temperature of the evaporator will vary with the evaporation pressure.

The superheat is the excess temperature of the vapor above its boiling point at the evaporating pressure. If there is no superheat it indicates that the refrigerant is not being fully vaporised in the evaporator and liquid may end up recirculated to the compressor, an excessive superheat indicates that there is insufficient refrigerant flow to chill the entire evaporator. Therefore by regulating the superheat to a small value, typically only a few °C, the heat transfer of the evaporator will be near maximal, without excess un-evaporated refrigerant being returned to the compressor. Some thermal expansion valves are also specifically designed to ensure that a certain minimum flow of refrigerant can always flow through the system. Thermal expansion valves are often referred to generically as "metering devices" although this may also refer to any other device that releases liquid refrigerant into the low-pressure section but does not react to temperature such as a capillary tube or a pressure-controlled valve.



3. Explain the working of ABS with a schematic diagram and discuss its advantages.

Ans.

ABS is part of an overall stability system, commonly known as electronic stability control, which monitors wheels' under heavy braking. Each wheel has a sensor attached to it.

If the intelligent sensors detect that a wheel is about to lock up and stop moving, the system will release the brake. The release is only for a moment.

ABS then continuously and repeatedly applies optimum braking pressure to each wheel, meaning the system will brake just enough to not lock the wheels.

When ABS is active you may feel pulsation through the brake pedal as you're pressing it.

The anti-lock system helps the driver remain in control of the vehicle rather than bringing the car to a stop.

It reduces the risk of skidding even when undertaking excessive evasive manoeuvres.

This is why it's important to remember that the car's braking distance may increase.

So, if you keep driving ahead straight into an obstacle, the car may not stop in time even if your instincts dictate otherwise. It's a common misconception that ABS helps reducing stopping distance.

How effective is it?

Certain older models can be bought without ABS, and some people do prefer not having it. But it's a very effective safety feature:

Cars fitted with ABS are less likely be involved in a fatal crash.

ABS decreases the chance of frontal collision on wet and dry roads.

Cars with ABS rarely stray from the road ahead.

It's worth keeping in mind that ABS works best on solid stable surfaces, and your experience on ice, snow or gravel can be different.

What if my car doesn't have ABS?

If you drive an older car, or your motor develops a fault and ABS stops working, you can simulate the system by applying the brake and releasing it repeatedly. No driver can brake as fast and as cadence as the system but it will still help you remain in control.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

SET- A

Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Summer Semester)

M. Voc. Program, 2nd Semester,

1st In-Sem. Examination

Course Code: AUT2110 **Time: 1 Hour**

Course Name: Additive Manufacturing (OE) **Max. Marks: 20**

Section – A

05X01 = 05 Marks

1. Which one of the following rapid prototyping processes uses a photosensitive liquid polymer as the starting material?
   a. Droplet Deposition Manufacturing.
   b. Fused-Deposition Modeling.
   c. Selective Laser Sintering.
   d. Stereo lithography Apparatus.
2. What's an STL?
   a. A 3D printing material.
   b. An acronym for Stereo lithography.
   c. A file type associated with printable 3D models.
   d. A nickname given to 3D fans.
3. What does FDM stands for?
   a. Filament Deposition Mesh.
   b. Fused Direct Metal.
   c. Fused Filament Fabrication.
   d. Fused Deposition Modeling.
4. FDM technology is patented by which of the company?
   a. EOS.
   b. HP.
   c. Stratasys.
   d. 3D systems.
5. Which axis determines if the object is 3D?
   a. Z.
   b. X.
   c. Y.
   d. O.

Section – B

03X02 = 06 Marks

1. Explain the general design consideration for 3D Printing.
2. Differentiate between SLA and SLS.
3. What do you mean by PLA and ABS? Write a comparative note among the two.

Section – C

03X03 = 09 Marks

1. Write a short note on Dimensional accuracy of 3D printed parts.
2. How does part orientation affect a 3D print?
3. Explain the impact of the layer height on the 3D printed part.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Summer Semester)

M. Voc. Program, 2nd Semester,

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Course Code: AUT2110 **Time: 1 Hour**

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   a. Z. (Ans.)
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   c. Y.
   d. O.

Section – B

03X02 = 06 Marks

1. Explain the general design consideration for 3D Printing.

Ans.

The most important thing to remember while designing for 3D printing is the fact that your digital design will become a physical object. In the digital design environment, there are no laws of physics to adhere to, such as gravity.

Anything can be "drawn" in 3D on a digital canvas, but not everything can be 3D printed. Each 3D printing process has its own limitations. Here are the most important design considerations that apply to all of them that you should keep in mind:

1. **Overhangs**

All 3D printing processes build parts layer-by-layer. Material cannot be deposited onto thin air, so every layer must be printed over some underline material.

Overhangs are areas of a model that are either partially supported by the layer below or not supported at all. There is a limit on the angle every printer can produce without the

need of support material. For example, for FDM and SLA this angle is approximately 45° degrees.

2. **Wall thickness**

The second thing to keep in mind when designing a part to be 3D printed is wall thickness. Every 3D printing process can produce accurately features that are thin up to a certain point.

For example, imagine you are an engineer who designs hang gliders for a living. You have come up with a great, new design that you have decided to 3D print scaled down for testing. 3D modeling programs allow you to model the sailcloth of the wing, but you would encounter problems when you would try to 3D print it, as its thickness would be extremely small.

3. **Warping**

Something that is often easily overlooked while designing a 3D model is the fact that the materials used for 3D printing undertake physical change: they are melted, sintered or scanned with a laser and solidified. The heating and cooling of material can cause the parts to warp while printing.

Large, flat surfaces can be especially prone to warping. Warping can typically be avoided by using correct machine calibration and having adequate surface adhesion between your part and the print bed. Your Hub will be able to offer more advice on design techniques that can be used to minimize the likelihood of warping.

4. **Level of detail**

When you are creating a 3D model with intricate details, it is important to keep in mind what is the minimum feature size each 3D printing process can produce. The minimum level of detail is connected to the capabilities and mechanics of each 3D printing process and to the selected layer height.

2. Differentiate between SLA and SLS.

Ans.

SLA (Stereolithography Apparatus):

SLA uses a build platform submerged into a translucent tank filled with liquid photopolymer resin. Once the build platform is submerged, a single point laser located inside the machine maps a cross-sectional area (layer) of a design through the bottom of the tank solidifying the material. After the layer has been mapped and solidified by the laser, the platform lifts up and lets a new layer of resin flow beneath the part. This process is repeated layer by layer to produce a solid part. Parts are typically then post-cured by UV light to improve their mechanical properties.

SLS (Selective Laser Sintering):

SLS produces solid plastic parts using a laser to sinter thin layers of powdered material one layer at a time. The process begins by spreading an initial layer of powder over the build platform. The cross-section of the part is scanned and sintered by the laser, solidifying it. The build platform then drops down one-layer thickness and a new layer of powder is applied. The process repeats until a solid part is produced. The result of this process is a component completely encased in unsintered powder. The part is removed from the powder, cleaned and then it is ready for use or further post-processing.

3. What do you mean by PLA and ABS? Write a comparative note among the two.

Ans.

ABS (Acrylonitrile Butadiene Styrene) is a common thermoplastic well known in the injection molding industry. It is used for applications such as LEGO, electronic housings and automotive bumper parts.

PLA (Polylactic Acid) is a biodegradable (under the correct conditions) thermoplastic derived from renewable resources such as corn starch or sugarcane. It is one of the most popular bioplastics, used for many applications ranging from plastic cups to medical implants.

- ABS and PLA are the most common desktop FDM printed materials and are typically similar in cost. ABS has superior mechanical properties but is harder to print with compared to PLA.
- PLA is ideal for 3D prints where aesthetics are important. Due to its lower printing temperature is easier to print with and therefore better suited for parts with fine details.
- ABS is best suited for applications where strength, ductility, machinability and thermal stability are required. ABS is more prone to warping.

Section – C

03X03 = 09 Marks

1. Write a short note on Dimensional accuracy of 3D printed parts.

Ans.

In order to help quantify the accuracy of a 3D printed part the following parameters will be used.

Dimensional accuracy: Quantitative values from machine manufacturers and material suppliers that state the expected accuracy of parts. All tolerances stated are with respect to well-designed parts on well calibrated machines.

Warping or shrinkage: The likelihood a part will warp or shrink during the printing stage. This depends heavily on design however some processes produce parts that are inherently more at risk of warping or shrinking.

Support requirements: For many 3D printing technologies, the amount of support used will govern how accurately a surface or feature is printed. The downside to this is that support affects the surface finish of a part as it must be removed.

2. How does part orientation affect a 3D print?

Ans.

Importance of Part Orientation is as follows:

1. Part Accuracy:

By orientating the part in different directions, there is a significant difference in the print quality.

2. Build time:

Orientation can also have a significant impact on print time.

For example, If a cylinder is printed in the horizontal orientation it will take significantly less time to print than the vertical, as the total number of layers is significantly reduced at a 100 µm layer height, the horizontal cylinder will be printed with 100 total layers and the vertical with 300 layers. This can add up to significant time differences for large parts.

3. Part strength:

Some 3D printing (notably FDM) build parts that have inherently anisotropic properties, meaning they are much stronger in the XY direction than the Z direction.

For functional parts, it is important to consider the application and the direction of the loads. For example, FDM parts are much more likely to delaminate and fracture when placed in tension in the Z direction compared to the XY directions (up to 4-5 times difference tensile strength).

3D printing technologies generally are much stronger in one direction compared to another

4. Support Structures:

Support material adds extra time and cost to a 3D print.

Often a lot of designing time is spent to the optimal part orientation to reduce the likelihood of print failure and the amount of required support.

5. Surface finish:

Generally, the top or upward facing surfaces of a 3D printed part will have the best surface finish, but this varies from process to process. For FDM, the top surface is smoothed by the extrusion tip, the surface in contact with the print bed will usually be glossy and the surfaces above support structures will have support marks.

3. Explain the impact of the layer height on the 3D printed part.

Ans.

All 3D printing processes build parts layer-by-layer. Due to the additive nature of 3D Printing, the thickness of each layer determines the resolution of a print in a similar way that the number of pixels determines the resolution of a television or computer monitor. Lower layer height typically results in parts with smoother surfaces. The downside is that the lower the layer height the longer it takes to complete a print.

It is important for a designer to determine whether aesthetics (a smoother surface) or time (and cost) savings are more important. In this article, we discuss the benefits and limitations of using different layer heights in 3D Printing.

For some printing processes (such as SLS, Material Jetting or SLM/DMLS) selecting a layer height is not very important, as their default resolution is already adequate for most applications or the layer height is already pre-set by the machine manufacturer.

For other processes (such as FDM and SLA) layer height is an important design parameter that impacts the printing time, cost, visual appearance and physical properties of a printed part.

Often the visual difference between parts printed at 100 µm and 200 µm is very small. However, the part at 100 µm will take twice as long to print (the 3D printer will have to trace twice as many cross sections) and this will have an impact on the cost.