BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2020-21(Winter)

B. Voc. Program, Vth Semester,

End-Sem. Examination

A

Course Code: AUT 1501 **Time: 2 Hours**

Course Name: AUTOMOTIVE MECHATRONIC SYSTEM **Max. Marks: 50**

Instruction:

1. Non Programmable Scientific Calculators are permitted.
2. Any assumptions made in attempt of questions may be mentioned.
3. All questions are compulsory.

Section – A

10X01 = 10 Marks

1. High efficiency superchargers help in overcoming the problem of turbo lag

(a) True

(b) False

2. In MPFI system engine cold running phase the ignition timing is corrected with reference to

(a) Coolant temperature

(b) RPM

(c) Load

(d) All of the above

3. What is the principle of application of canister purge

(a) Exhaust emissions

(b) Evaporation emissions

(c) Both (a) & (b)

(d) None of the above

4. Valve timing has direct bearing on exhaust emissions by way of

(a) Control of valve timing at different rpm.

(b) Valve overlap

(c) None of the above

(d) Both (a) & (b).

5. IR Temperature sensor is a _____ type of temperature sensor

(a) Active

(b) Contact

(c) Silent

(d) Non- contact .

6. When "Active Steering" & " Chassis Systems" are linked to ESP , it is called

(a) Adaptive Cruise Control

(b) Dynamic Brake Management

(c) Vehicles Dynamics Management

(d) Chauffeur Brakes.

7. The TCS gets activated when throttle input and engine torque are mismatched to road surface conditions:
TRUE/FALSE

8. The TCS controls wheel speed by
(a) Stop spark in one or more cylinders.
(b) Reduce fuel supply to a cylinder.
(c) Close the throttle
(d) All of the above

9. The main function of transmission system is to....
(a) Engine always operates in the best conditions
(b) Provide reverse movement
(c) Stop the vehicle
(d) None of the above.

10. Hill descent control is a.....
(a) Safety function
(b) Comfort function
(c) Navigation function
(d) Convenience function

Section – B

04X04 = 16 Marks

11. What are active & passive sensors? Explain with example of one each.

12. Does TCS also reduce power going to one particular wheel? If yes, how?

13. What are the differences between Active and Passive sensors? Explain with examples.

14. What happens if one sensor goes faulty? Does the ECU stop the engine?

Section – C

04X06 = 24 Marks

15. How does hot wire air flow sensor work?

16. What are the differences in Semi-automatic transmission and Fully Automatic transmission system?

17. Explain the principle of working of a sensor using Hall Effect.

18. What are the various sequences that a MPFI injector system can have and what are the disadvantages of MPFI System?

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Set A

Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Winter Semester)

B. Voc. Program, 5th Semester,

End Sem. Examination

Course Code: AUT1502 **Time: 2 Hours**

Course Name: Automotive Electrical and A.C. **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

Q 1. Which of the following temperature value is usually not measured in a car?

a) Fuel temperature.
b) Manual transmission oil temperature.
c) Passenger compartment temperature.
d) Exhaust gas temperature.

Q 2. What kind of device is shown in the picture below?

a) Temperature sensor.
b) VSS.
c) Knock sensor.
d) Oil pressure switch.

Q 3. Which of the following sentences is wrong? Automotive networking is used because:

a) ..it simplifies the communication between the ECU's.
b) ..internet of things(IoT) is growing day by day.
c) ..the amount of ECU's in cars increased rapidly.
d) ..it reduces the amount of wires.

Q 4. Which of the following systems provides the lowest data transfer rate?

a) CAN-FD.
b) CAN-B.
c) CAN-C.
d) LIN.

Q 5. MOST is used to communicate with:

a) ..the infotainment systems.
b) ..the emission control system.
c) ..the powertrain control unit.
d) ..safety systems (e.g. ESP).

Q 6. What is the main function of relay?

a) Sends and receive radio signals.
b) Switches electrical currents.
c) Generate high voltage.
d) Generates electricity.

Q 7. Which of the following topology is used for MOST System?

a) Star.
b) BUS.
c) Ring.
d) All of the above.

Q 8. The spark ignition system of BMW sparks up to nine times at the end of the compression stroke. What is the purpose?

a) To increase the spark accuracy under high RPM.
b) To make the spark system more reliable.
c) To increase the spark duration under low RPM and cold start.
d) To increase the efficiency during coasting.

Q 9. A hydrometer is used to determine:

a) Relative Humidity.
b) Buoyancy Force.
c) Viscosity of Fluid.
d) Specific Gravity of Liquid.

Q 10. What are the causes for a defective supply voltage?

a) Broken Wire.
b) Corroded plug.
c) Defective main fuse.
d) All of the above.

Section – B

04X04 = 16 Marks

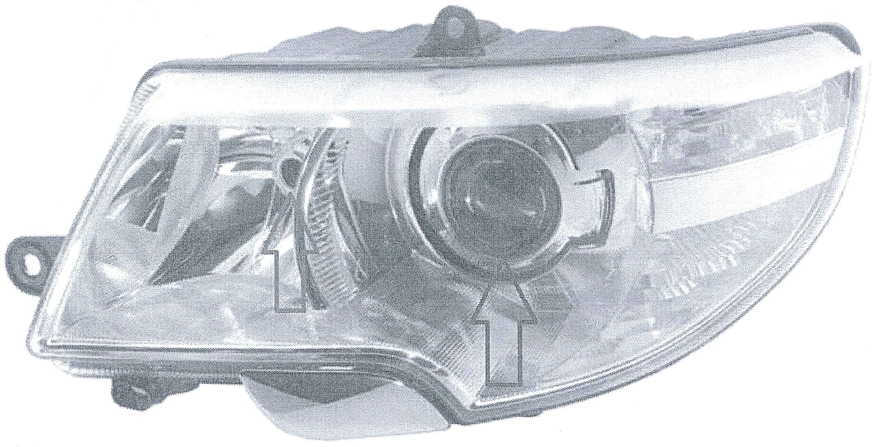
Q 11. What do you understand by actuators? Why the actuators are used in the automotive vehicles?

Q 12. Define the term "Fault Code Readers" to identify the codes while scanning the sensors in the automotive vehicle.

Q 13. Explain the followings:

a) MOST.
b) Automotive Ethernet.

Q 14. Most of the modern cars use headlamps like the one shown below. There are two different type of reflectors A and B. Which reflector type would you choose for high beam and for low beam, justify your answer.



A B

Section – C

04X06 = 24 Marks

Q 15. What do you understand by automotive sensors? What are the rules to obey for a good sensor in the vehicle?

Q 16. Explain about the standard interfaces given below:

a) ALDL.
b) OBD-I.
c) OBD-1.5.
d) OBD-II.
e) E-OBD.
f) KTS-590.

Q 17. Suppose an old technician comes to you and argues; "Automotive networking systems are not required. Back in the good old days the cars worked totally fine without these systems" Explain with six different reasons why these systems are crucial today.

Q 18. Explain about the general electrical troubleshooting process in the automotive vehicles.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Set A
AK

School of Automotive Skills

Session: 2020-21 (Winter Semester)

B. Voc. Program, 5th Semester,

End Sem. Examination

Answer key

Course Code: AUT1502 Time: 2 Hours

Course Name: Automotive Electrical and A.C. Max. Marks: 50

Section – A

Q 1. Which of the following temperature value is usually not measured in a car?

Answer: b. Manual transmission oil temperature.

Q 2. What kind of device is shown in the picture below?

Answer: d. Oil pressure Switch.

Q 3. Which of the following sentences is wrong? Automotive networking is used because:

Answer: b. internet of things (IoT) is growing day by day.

Q 4. Which of the following systems provides the lowest data transfer rate?

Answer: d. LIN.

Q 5. MOST is used to communicate with:

Answer: a. the infotainment systems.

Q 6. What is the main function of relay?

Answer: b. Switches Electrical Current.

Q 7. Which of the following topology is used for MOST System?

Answer: a. Star.

Q 8. The spark ignition system of BMW sparks up to nine times at the end of the compression stroke. What is the purpose?

Answer: c. to increase the spark duration under low RPM and cold start.

Q 9. A hydrometer is used to determine:

Answer: d. Specific gravity of liquid.

Q 10. What are the causes for a defective supply voltage?

Answer: d. All of the above.

Section – B

04X04 = 16 Marks

Q 11. What do you understand by actuators? Why the actuators are used in the automotive vehicles?

Answer: An actuator is a component of a machine that is responsible for moving and controlling a mechanism or system, for example by opening a valve. In simple terms, it is a "mover".

An actuator requires a control signal and a source of energy. The control signal is relatively low energy and may be electric voltage or current, pneumatic, or hydraulic fluid pressure, or even human power. Its main energy source may be an electric current, hydraulic pressure, or pneumatic pressure. When it receives a control signal, an actuator responds by converting the source's energy into mechanical motion. In the electric, hydraulic, and pneumatic sense, it is a form of automation or automatic control.

An actuator is a mechanism by which a control system acts upon to perform an operation or task. The control system can be simple (a fixed mechanical or electronic system), software-based (e.g. a printer driver, robot control system), a human, or any other input.

Q 12. Define the term "Fault Code Readers" to identify the codes while scanning the sensors in the automotive vehicle.

Answer:

Fault code readers are the readers which reads the faulty codes while scanning the automotive vehicle with the desired tool.

OBD-II diagnostic trouble codes (DTCs) contain 1 letter and 4 numbers, and are divided into the following categories:

B – Body (includes air conditioning and airbag) (1164 codes)

C – Chassis (includes ABS) (486 codes)

P – Powertrain (engine and transmission) (1688 codes)

U – Network (wiring bus) (299 codes).

Q 13. Explain the followings:

a) MOST.

b) Automotive Ethernet.

Answer:

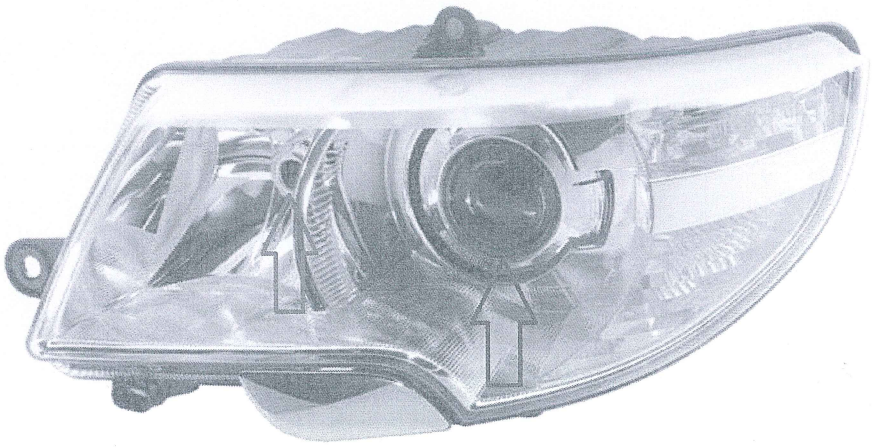
a) MOST (Media Oriented Systems Transport) is a high-speed multimedia network technology optimized by the automotive industry. It can be used for applications inside or outside the car. The serial MOST bus uses a daisy-chain topology or ring topology and synchronous data communication to transport audio, video, voice and data signals via plastic optical fibre (POF) (MOST25, MOST150) or electrical conductor (MOST50, MOST150) physical layers. MOST technology is used in almost every car brand worldwide, including Audi, BMW, General Motors, Honda, Hyundai, Jaguar, Lancia, Land Rover, Mercedes-Benz, Porsche, Toyota,

Volkswagen, SAAB, SKODA, SEAT and Volvo. SMSC and MOST are registered trademarks of Standard Microsystems Corporation ("SMSC"), now owned by Microchip Technology.

b) The Ethernet used in automotive vehicles such as cars is known as automotive Ethernet. It is a physical network which is used to connect various components within a car using wired network. This Ethernet type has following features:

- Should support High Data Rate without EMI/EMC problems.
- Should meet latency, synchronization and bandwidth requirements.
- Power should be delivered over Ethernet cables.
- Should support distributed network architecture for communication.
- Should work with TCP/IP based protocols.

Q 14. Most of the modern cars use headlamps like the one shown below. There are two different type of reflectors A and B. Which reflector type would you choose for high beam and for low beam, justify your answer.



A B

Answer:

Green (A): High beam, reflector type is much cheaper compare to the projector type.

Red (B): Low beam, projector type is much more accurate compare to reflector type.

Therefore, I would choose A for low beam because the light dark boundary can be projected much more accurate compared to reflector type. For high beam a reflector type is sufficient because it is cheaper compare to a projector type and the accuracy is less important in high beam.

Section – C

04X06 = 24 Marks

Q 15. What do you understand by automotive sensors? What are the rules to obey for a good sensor in the vehicle?

Answer:

In the broadest definition, a sensor is a device, module, machine, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor. A sensor is always used with other electronics.

A good sensor obeys the following rules:

1. It is sensitive to the measured property
2. It is insensitive to any other property likely to be encountered in its application, and
3. It does not influence the measured property.

Types of sensors:

1. Chemical sensor.
2. Bio sensor.
3. MOS (metal oxide semiconductor sensor
4. Biochemical.
5. Image sensor.
6. Monitoring sensor.

Q 16. Explain about the standard interfaces given below:

a) ALDL.
b) OBD-I.
c) OBD-1.5.
d) OBD-II.
e) E-OBD.
f) KTS-590.

Answer:

a) **ALDL**

GM's ALDL (Assembly Line Diagnostic Link) is sometimes referred as a predecessor to, or a manufacturer's proprietary version of, an OBD-I diagnostic. This interface was made in different varieties and changed with power train control modules (aka PCM, ECM, ECU). Different versions had slight differences in pin-outs and baud rates. Earlier versions used a 160 baud rate, while later versions went up to 8192 baud and used bi-directional communications to the PCM.

b) **OBD-I**

The regulatory intent of OBD-I was to encourage auto manufacturers to design reliable emission control systems that remain effective for the vehicle's "useful life". The hope

was that by forcing annual emissions testing for California, and denying registration to vehicles that did not pass, drivers would tend to purchase vehicles that would more reliably pass the test. OBD-I was largely unsuccessful, as the means of reporting emissions-specific diagnostic information was not standardized. Technical difficulties with obtaining standardized and reliable emissions information from all vehicles led to an inability to implement the annual testing program effectively.

c) **OBD-1.5**

OBD 1.5 refers to a partial implementation of OBD-II which General Motors used on some vehicles in 1994, 1995, & 1996. (GM did not use the term OBD 1.5 in the documentation for these vehicles — they simply have an OBD and an OBD-II section in the service manual.)
For example, the 94–95 Corvettes have one post-catalyst oxygen sensor (although they have two catalytic converters), and have a subset of the OBD-II codes implemented. For a 1994 Corvette the implemented OBD-II codes are P0116-P0118, P0131-P0135, P0151-P0155, P0158, P0160-P0161, P0171-P0175, P0420, P1114-P1115, P1133, P1153 and P1158.
This hybrid system was present on the GM H-body cars in 94–95, W-body cars (Buick Regal, Chevrolet Lumina ('95 only), Chevrolet Monte Carlo ('95 only), Pontiac Grand Prix, Oldsmobile Cutlass Supreme) in 94–95, L-body (Chevrolet Beretta/Corsica) in 94–95, Y-body (Chevrolet Corvette) in 94–95, on the F-body (Chevrolet Camaro and Pontiac Firebird) in 95 and on the J-Body (Chevrolet Cavalier and Pontiac Sunfire) and N-Body (Buick Skylark, Oldsmobile Achieva, Pontiac Grand Am) in 95 and 96 and also on '94-'95 Saab vehicles with the naturally aspirated 2.3.

d) **OBD-II**

OBD-II is an improvement over OBD-I in both capability and standardization. The OBD-II standard specifies the type of diagnostic connector and its pinout, the electrical signaling protocols available, and the messaging format. It also provides a candidate list of vehicle parameters to monitor along with how to encode the data for each. There is a pin in the connector that provides power for the scan tool from the vehicle battery, which eliminates the need to connect a scan tool to a power source separately. However, some technicians might still connect the scan tool to an auxiliary power source to protect data in the unusual event that a vehicle experiences a loss of electrical power due to a malfunction. Finally, the OBD-II standard provides an extensible list of DTCs. As a result of this standardization, a single device can query the on-board computer(s) in any vehicle. This OBD-II came in two models OBD-IIA and OBD-IIB. OBD-II standardization was prompted by emissions requirements, and though only emission-related codes and data are required to be transmitted through it, most manufacturers have made the OBD-II Data Link Connector the only one in the vehicle through which all systems are diagnosed and programmed. OBD-II Diagnostic Trouble Codes are 4-digit, preceded by a letter: P for engine and transmission (powertrain), B for body, C for chassis, and U for network.

e) **EOBD**

The European on-board diagnostics (EOBD) regulations are the European equivalent of OBD-II, and apply to all passenger cars of category M1 (with no more than 8 passenger seats and a Gross Vehicle Weight rating of 2500 kg or less) first registered within EU member states since January 1, 2001 for petrol (gasoline) engine cars and since January 1, 2004 for diesel engine cars.

For newly introduced models, the regulation dates applied a year earlier - January 1, 2000 for petrol and January 1, 2003 for diesel.

For passenger cars with a Gross Vehicle Weight rating of greater than 2500 kg and for light commercial vehicles, the regulation dates applied from January 1, 2002 for petrol models, and January 1, 2007 for diesel models.

The technical implementation of EOBD is essentially the same as OBD-II, with the same SAE J1962 diagnostic link connector and signal protocols being used.

With Euro V and Euro VI emission standards, EOBD emission thresholds are lower than previous Euro III and IV.

f) **KTS-590**

The KTS 590 communication module ensures the most advanced ECU diagnosis for Ethernet-based (DoIP – Diagnostics over Internet Protocol) vehicle interfaces with features that will significantly enhance your workshop's output.

Q 17. Suppose an old technician comes to you and argues; "Automotive networking systems are not required. Back in the good old days the cars worked totally fine without these systems" Explain with six different reasons why these systems are crucial today.

Answer:

- Low cost: Less wires required.
- Centralized: Allows central error diagnosis. (OBDII)
- Robust: Robust towards electric disturbances.
- Efficient: CAN frames are prioritized by ID.
- Flexible: it's very easy to add additional ECU's
- Increase of ECU's: more and more ECU's are installed in cars and they all depend of each other.

Q 18. Explain about the general electrical troubleshooting in the automotive vehicles.

Answer:

With time, every mechanic will gradually develop its own troubleshooting procedure. Until then, using a general troubleshooting procedure will help you get there and learn what works best for you at the same time.

The most important steps are:

Confirming the problem

Customers don't always provide an accurate and detailed description of the problem at hand. If a driver notices a problem in the lighting system of his vehicle, he will usually indicate that "a light bulb doesn't work". This kind of description really does not say much about the nature of the problem. It is therefore essential to check the whole lighting system to find out which lighting device is not working before everything else.

You might even discover that more than one light bulb is at fault, which would eliminate the bulbs from the probable causes and would lead you to suspect a problem in the ground distribution system for example. The whole right side of the lighting system could also be down, letting you know that something controlling that side may need to be inspected.

Intermittent electrical problems

It's also important to investigate to see if the problem is present at all time or intermittent. Finding the source of an electrical problem is hard enough without having to perform tests on a circuit while everything is in good working condition. Sadly, in the case of an intermittent problem, there's not much to be done. It's almost impossible to locate a faulty component when the problem is not present.

In the case of an intermittent problem, it is strongly suggested that you ask your client as many questions as possible. Since the faulty circuit can't be physically tested, collecting as much information as you can is crucial to understand which system and what component to suspect first.

Developing a hypothesis

Now that you have some basic information about the problem and understand how the vehicle is misbehaving, you should be able to have a good idea of where to look first and some of the probable faulty components.

Write down a list of the most likely culprits and keep it within reach. Your hypothesis doesn't have to be 100% right all the time and you shouldn't feel tied down by it. Its purpose is only to give you a starting point for the troubleshooting process. As you gain experience, you'll learn to pose better hypotheses which should allow you to skip some steps and jump right down to where the problem is most likely located right away.

Collecting technical information

Before starting any kind of troubleshooting on an electrical system, get your hands on your car's repair manual and find out the wiring diagram corresponding to the system concerned. Having access to electrical diagrams to perform your test is a definite advantage and is not to neglect.

Learning how to read car wiring diagrams will help you quickly locate connectors, fuses, and numerous other test points as well as to understand how the circuit is built, how it's doing its job and the main components at play. You can still troubleshoot electrical problems without

a wiring diagram but you'll have to remove more unnecessary trims to follow the wires and perform your test as you go.

If you are lucky enough to work at a car dealer or an auto repair shop having access to Technical Service Bulletins, make sure to put them to use. TSBs are files created by the car manufacturers containing know problems and their quick fixes to help you speed up the troubleshooting part. Dealers have access to large vehicle data banks and are able to identify repeating patterns in the repairs performed on car models. Each bulletin released is related to a distinct problem on a specific vehicle and includes information on what should be tested, in what order and what you'll have to do to fix it. They contain really valuable information so always remember to take a minute and check the availability of TSBs for the car you are working on.

Performing the preliminary steps

If the electrical problem is permanent and related to a particular circuit, start by performing a visual inspection of the circuit in question. The cause of an electrical problem is sometimes obvious and performing a visual inspection could save you some precious time.

The main elements to visually inspect, depending on the electrical circuit involved, are:

- Loose battery terminals;
- Main electrical connectors;
- Control modules ground;
- Engine, transmission and body grounds.
- If the problem is intermittent, check the electrical sub-circuits of the circuit in question for:
- Partially disconnected connector;
- Deformed or damaged connector plugs
- Bad electrical splice;
- Electrical circuit too close to a magnetic field;
- Antifreeze or brake fluid on the connections.
- Testing the battery

This one is pretty obvious but is also often overlooked by beginner auto mechanics and even full-fledged technicians from time to time. Make sure that the battery is fully charged before testing anything else.

If a customer's complaint is that the lights are dimmed, the problem could be related to a faulty alternator instead and mislead you into suspecting an electrical problem.

Battery problems are one of the main causes of electrical failures. If the battery is not in good working condition, it simply can't deliver the power needed by the car accessories and the whole engine management system. A failing battery or charging system will frequently cause weird, unusual and intermittent problems. Be aware of that.

Troubleshooting

Inspect the main components of the system

9 out of 10 times your troubleshooting will stop right there. The cause of an electrical problem is most frequently the main component of the system.

For example, if the LR (Left-Front) blinking light stops working, the light bulb is most likely burnt. If the RF window stops going up or down, there's almost 90% chance that the RF power window regulator is at fault. If it's not, the culprit is most likely the second most important component, namely the power window main switch.

This is only a general rule and of course, you shouldn't just replace a component without testing it first. You still need to make sure the problem doesn't come from somewhere else like a broken power wire or a blown relay.

The quickest way to test an electrical motor is by elimination. Take out your multimeter and make sure there are power and ground coming into the suspected part's connector. If the motor has power and ground, there's no reason it shouldn't be turning and it will need to be replaced. If you get no voltage reading or bad ground wire, the problem is somewhere else.

Inspect the other components of the system you are having problems with. Internal components problems are simply more frequent than cut wires and short to ground conditions. Never forget that the ignition switch, fuse wires, fuses, circuit breakers, switches, switches, and splices should be considered as sources of secondary problems and should always be checked right after the main component.

Testing the fuses

If there's no power coming to the motor, the next step is to check the fuses. Electrical systems are divided into sectors, and each sector has a fuse protecting it against overloads. The fuse consists of a lead wire placed on a support and integrated into the input circuit of the sector. Lead is a metal that heats up easily when the current passes through and quickly melts and cuts off the current in the sector instantly in case of overload.

A blown fuse is often a consequence of an electrical problem and rarely the cause of it. Make certain that you find what caused the fuse to blow in the first place before replacing it or it will simply blow again.

Visually

Locate the fuse protecting the electrical circuit on your car wiring diagram. A number or code next to it should indicate where it's found on the vehicle.

Use the fuse removal tool provided with the fuse box to easily remove the fuse and inspect it. If you notice a black spot or if the lead wire looks like its cut in half, the fuse is definitely blown and needs to be changed.

Using a multimeter

To test a fuse using a multimeter, select the continuity test or resistance mode. Try to touch both positive and negative probes together and note down the value displayed on the

multimeter. Different multimeters will display different codes or sounds to indicate continuity or an Open Loop condition.

Place the probes of the multimeter on the two metal blades at the back of the fuse. If a beep is heard or some resistance reading is displayed, the fuse is still good. On the other hand, if it doesn't beep or "OL" appears on the multimeter, the fuse is defective and will need to be replaced.

Using a test light

A test light is the best tool to use for fuse testing. In fact, a test light typically can't tell you anything else than if there's power or not. No voltage reading is available but when the time comes to test a fuse, that's all we need.

With the ignition key turned on, connect the test light clip to the negative terminal of the battery and alternatively touch the fuse's metal blades with the probe. If the fuse is blown, the test light will light up only when touching one of the two metal blades.

Further troubleshooting

Now that you know for sure that the main component of the system is okay and that the fuse is good, you'll need to perform more test to isolate the source of the problem. The easiest way to do that is to divide the circuit into simpler elementary circuits. This operation can be done in two ways. Physically, by opening connectors for example, or mentally, using your car's wiring diagram as a reference. The second method will save you the most time for two reasons: first, the electrical diagram allows to separate the complex circuits into simpler circuits without having to physically touch or disassemble anything on the vehicle. Secondly, you'll be able to perform certain diagnostic operations mentally and to eliminate large parts of the circuit from the possible suspects simply by using your logic and basic deductions. Having to use equipment to perform all the tests physically would take a long time considering you sometimes need to remove numerous trims and accessories to reach specific connectors.

Isolating the problem

The key here is to eliminate a good part of the circuits and to concentrate the research on the sub circuit which could be at the source of the problem. Since the problem is not the motor, nor the power source, the faulty component can only be located in two places: between the motor and the power source or between the motor and the ground.

Depending on the results of the test you've performed so far, you are now looking to find why either the power or ground is not being measured at the connector. If there's no 12v to the connector, inspect the circuit ahead of the motor. Start with the power distribution centre or just after the fuse. Follow the wire and test it at every connector along the way until you find one with no power.

Same thing for the ground but in the opposite direction. Inspect the system wiring diagram and find the location of the ground for this motor. Remove the trims, follow the ground wire and inspect it for damages as you go.

Performing the repair

This one is pretty self-explanatory. Once you have found the cause of the electrical problem, you can then formulate a diagnostic with confidence in mind and repair the whole thing. In the case of a burnt component, make sure you clearly understand what caused it to burn in the first place before you replace it. Failure to do so could result in the component blowing up again the moment you plug it back in. If there's a short on the wire or a skinned ground wire is touching another 12v power source, the current could instantly ruin expensive internal electronic elements. Only reinstall the new part once you have repaired the problem.

Performing post-repair verifications

Never forget to confirm the repair before putting the car back on the road. Nothing is more frustrating than dedicating hours into troubleshooting a faulty radiator fan, taking the car out for a drive right after you have replaced the fan relay only to find yourself stranded on the side of the road with an overheating engine minutes later and in need of a tow truck.

Wrapping it up

Electrical problems can sometimes be intimidating and somewhat daunting at first. Rest assured, with the help of your vehicle's repair manual and some basic electrical troubleshooting knowledge, everybody should be able to find and fix most electrical problems in no time. When in doubt, never hesitate to ask a certified mechanic for help. Tapping into the expertise of a more knowledgeable technician will often save you time and money as well as teach you some important tips and tricks of the trade.

Set A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

5th Semester, End-Sem. Examination

B. Voc. Program, Winter Semester (2020-21)

Course Code: AUT1503 | **Time: 2 Hour**

Course Name: Workshop Management | **Max. Marks: 50**

Instruction:

1. All the questions are compulsory to attend.
2. Students are not allowed to bring any smart device or cell phone in the exam hall.
3. Marks will be deducted if any overwriting in words will be found.

Section – A

10X01 = 10 Marks

Q.1 Reliability engineering covers:

a) Reliability
c) Maintainability
b) Availability
d) All of the above

Q 2. .....is the probability of performing a successful repair action within a given time:

a) Maintainability
c) Reliability
b) Design for Manufacturing
d) FMEA

Q 3. 300 cars have accumulated 45000 hours;10 failures are observed what is the MTBF? What is the failure rate?

a) 4500 hours, 0.00022/hour
c) 450 hours, 0.00022/hour
b) 4500 hours, 0.0022/hour
d) None of the above

Q 4. Which of the followings are characteristics of break-even point?

a) No loss and no profit to the firm
c) Contribution equal to fixed cost
b) Total revenue= to total cost
d) All of the above

Q 5. Given selling price is Rs. 10 per unit, variable cost is Rs. 6 per unit and fixed cost is Rs 5000. What is the break-even point?

a) 500 units
c) 1000 units
b) 1250 units
d) None of the above

Q.6 Which of the following methods of stock control aims at concentrating efforts on selected items of materials:

a) Perpetual inventory system
c) Material turnover ratio
b) Level setting
d) ABC analysis

Q 7. Fishbone diagram is an example of:

a) Relevant costing diagram
c) Control chart
b) Cause and effect diagram
d) Pareto diagram

Q 8. What is the purpose of the 5S in the workshop/workplace?

a) Cleanliness
b) Efficiency
c) Organization
d) All of the above

Q 9. Which of the followings is not the aim of kaizen process:

a) To make process efficient
b) To make process controllable
c) To make process effective
d) To make process uncontrollable

Q 10. Quality circle is a:

a) Japanese concept
b) Historic concept
c) British concept
d) Chinese concept

Section – B

04X04 = 16 Marks

Q-11. Explain Quality circle with neat sketch.
Q-12. Write down various safety equipment used in Automotive workshop.
Q-13. Explain the concept of zero defect in details
Q-14. Explain forecasting and prediction and differentiate between them.

Section – C

04X06 = 24 Marks

Q-15. Explain different types of forecasting methods based on methodology.
Q-16. Explain kaizen and 5S used in automotive workshop in details with neat sketch.
Q-17. Explain ABC analysis in details with neat sketch. How ABC analysis applied in automotive workshop?
Q-18. Explain reliability, various terminologies used in reliability, explain bath tub curve with neat sketch.

A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Winter Semester) Answer Key

B. Voc. Program, 3rd Semester,

5th Sem. Examination

Course Code: AUT-1503 | **Time: 1 Hour**

Course Name: Workshop Management | **Max. Marks: 50**

Instruction: (if any)

Section – A

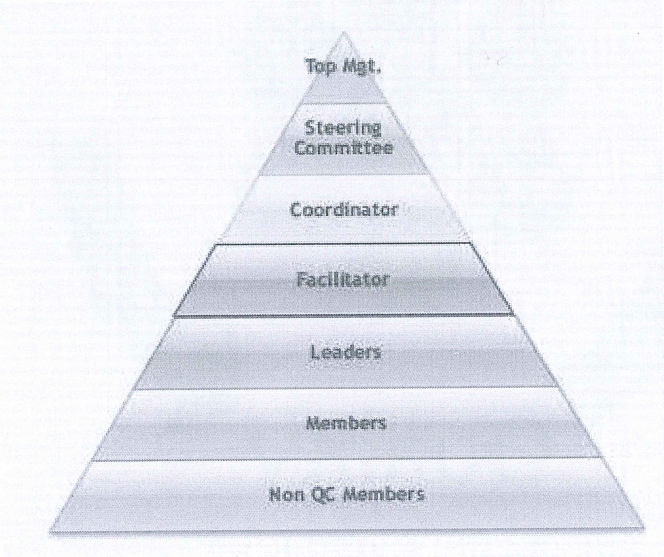
10X01 = 05 Marks

1. d
2. b
3. B
4. C
5. D
6. A
7. A
8. A
9. B
10. c

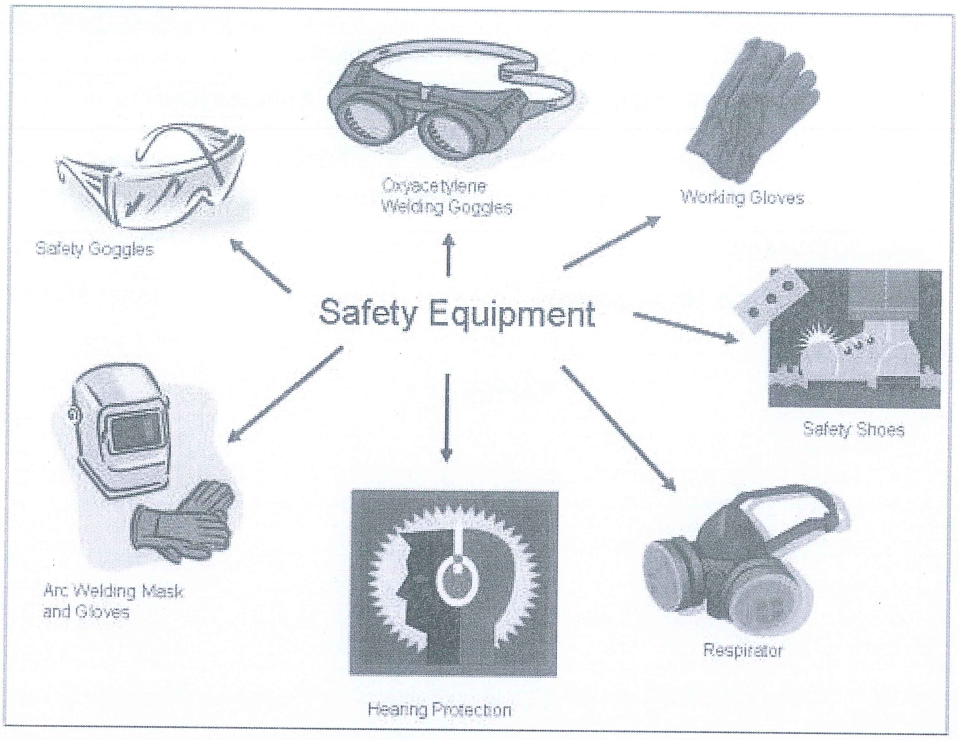
Section – B

04X04 = 16 Marks

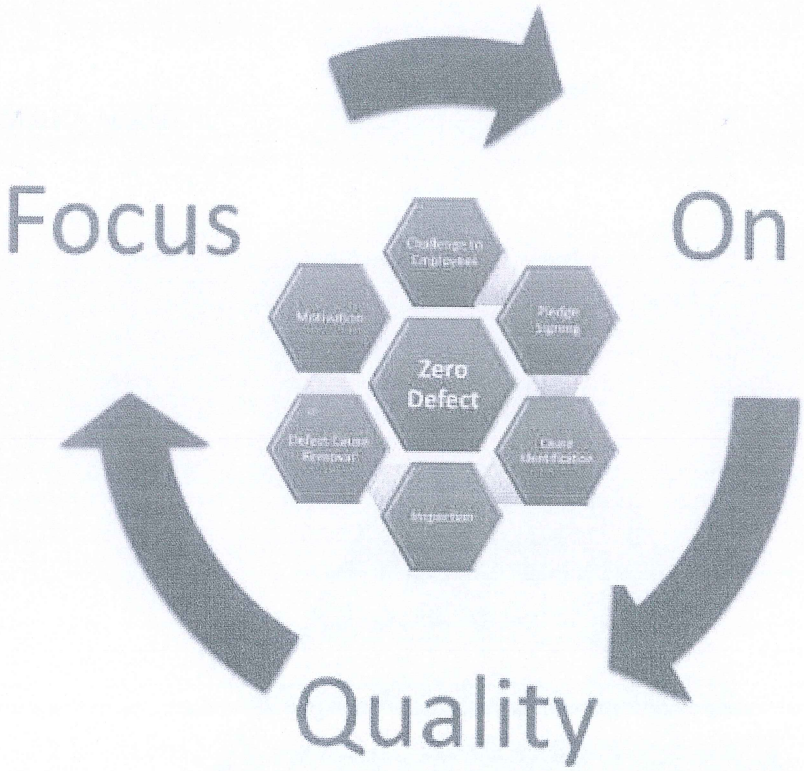
Q11



Q12


Safety Goggles
Oxyacetylene Welding Goggles
Working Gloves
Safety Equipment
Safety Shoes
Arc Welding Mask and Gloves
Respirator
Hearing Protection

Q13


Focus
On
Zero Defect
Quality

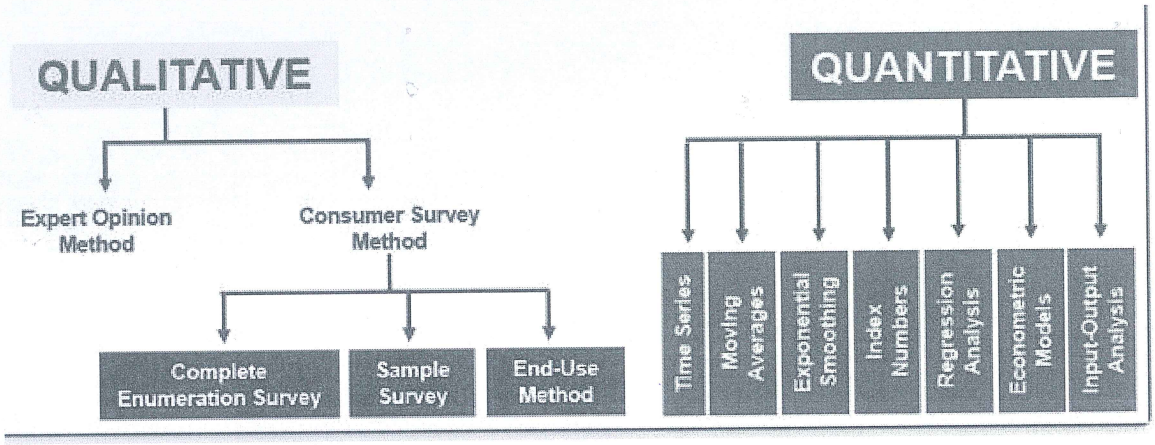
Q14

Scenarios	Forecasts	Predictions
Plausible futures	Probable futures	Based on past performance
Based on uncertainty	Based on greater levels of certainty	Based on political pressure/lobbying
Will make different trends visible	Based on different trends but complicated model with increasing number of trends	Based on trends usually one at a time.
Illustrate uncertainty	Hide risks and uncertainties	Well hidden risks and uncertainties
Qualitative or quantitative	Quantitative	Quantitative and pressured
Used rarely	Used daily	Every day
Strong for a medium- to long-term perspective and when there are uncertainties	Strong for a short-term perspective and when there is a low degree of uncertainty	Strong for short-term and where there are strong political pressure (i.e. global warming)

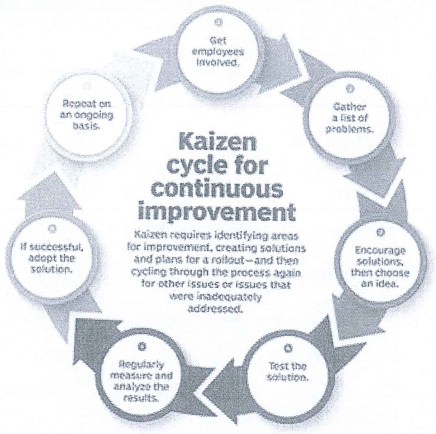
Section – C

04X06 = 24 Marks

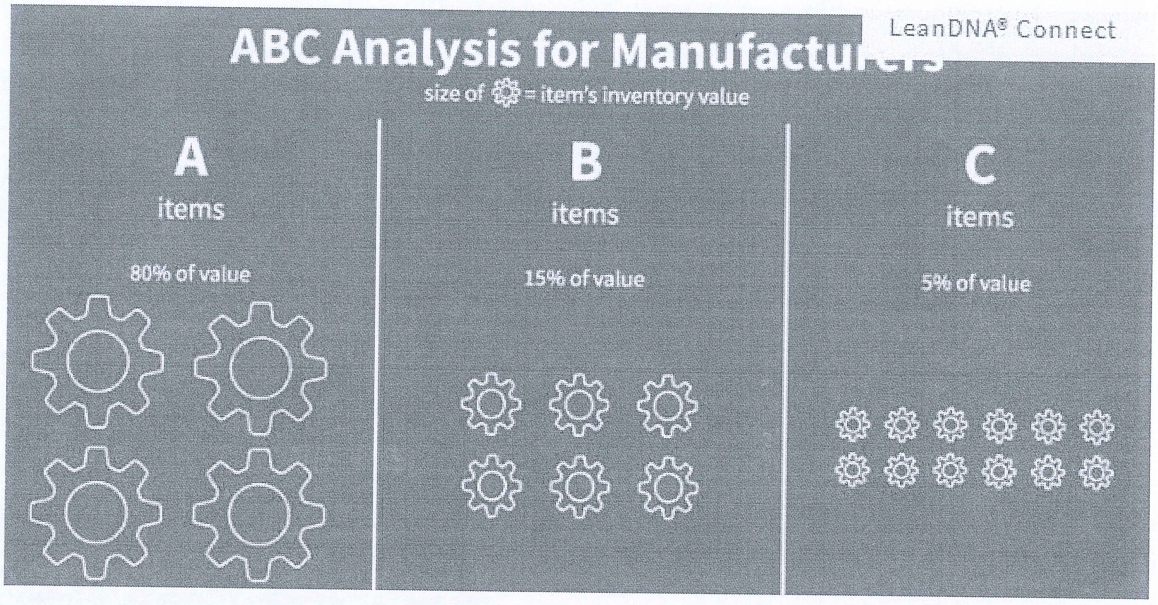
Q15



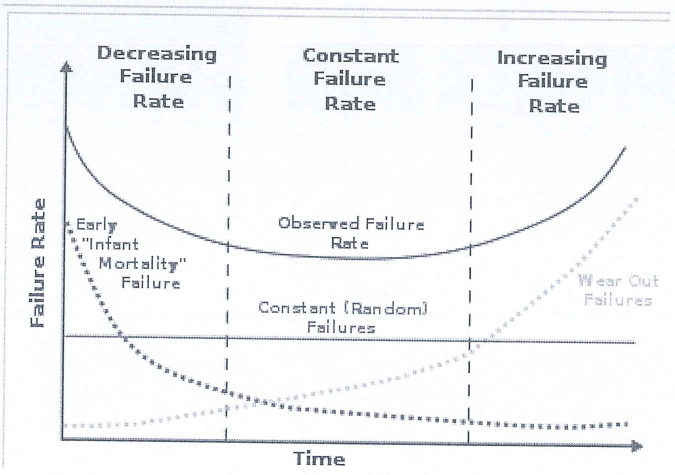
Q16


Kaizen cycle for continuous improvement
Kaizen requires identifying areas for improvement, creating solutions and plans for a rollout—and then cycling through the process again for other issues or issues that were inadequately addressed.
Get employees involved.
Gather a list of problems.
Encourage solutions, then choose an idea.
Test the solution.
Regularly measure and analyze the results.
If successful, adopt the solution.
Repeat on an ongoing basis.

Q17


LeanDNA® Connect
ABC Analysis for Manufacturers
size of ⚙ = item's inventory value
A
items
80% of value
B
items
15% of value
C
items
5% of value

Q18


Decreasing Failure Rate
Constant Failure Rate
Increasing Failure Rate
Failure Rate
Early "Infant Mortality" Failure
Observed Failure Rate
Constant (Random) Failures
Wear Out Failures
Time

Set A

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

5th Semester, End-Sem. Examination

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

Course Code: AUT1504 **Time: 2 Hour**

Course Name: Paint Shop Management **Max. Marks: 50 marks**

Instruction:

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

Section – A

10X01 = 10 Marks

Q-1. Which of the following variables does not affect the drying time of coating?

a. Air flow and movement
c. Type of substrate
b. Surface temperature
d. Solvent selection

Q-2. How many angles are required to inspect a color?

a. One
c. Three
b. Two
d. None of these

Q-3. Painter A says: Used thinner & paint material should be stored in a separate tank.

Painter B Says: Do not discard used thinner & paint material in the garbage as these are harmful for the environment.

Who is correct?

a. Painter A
c. Both (a) and (b)
b. Painter B
d. None of the above

Q-4. What are the possible causes for the pin holes in the paint film?

a. Improper cleaning of panel
c. Due to the moisture in compressed air
b. Due to improper Flash-off time
d. All of the above

Q-5. Where we use the flop controller?

a. In solid paint
c. In Pearl paint
b. In metallic paint
d. Both (b) and (c)

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Q-6. What is the effect on spray gun performance due to increase in number of air atomizing holes?

a. Paint atomization will be good
b. Both (a) and (c)
c. Air discharge amount will be more
d. None of these

Q-7. Why plastic parts are painted?

a. To enhance the gloss
b. To save from environmental effects
c. Both (a) and (b)
d. None of these

Q-8. Which of the following paint layer is not a part of refinish painting?

a. Zinc Phosphate
b. Body Filler
c. Epoxy primer
d. None of the above

Q-9. Orange peel defect generally occurs during..... application.

a. Primer
b. Clear coat
c. Base Coat
d. All of the above

Q-10. What is the recommended distance between infrared lamp and panel?

a. 80mm
b. 100mm
c. 80 cm
d. 140cm

Section – B

04X04=16 Marks

Q-11. What will be the probable causes in Paint booth if the pressure inside the paint booth is too high? Write its remedies?

Q-12. Write the SOP for color matching.

Q-13. Write the SOP for Plastic painting of a new panel.

Q-14. Write the Parameters involved in Painting cost estimation.

Section – C

04X06 =24 Marks

Q-15. Explain different types of borders used in masking.

Q-16. What is the role of damper in the paint booth? What will happen if the damper does not function properly?

Q-17. Write the SOP for spot repair using metallic paint.

Q-18. Explain any four Paint application defects with its causes and remedies.

Set A

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Answer key

School of Automotive Skills

5th Semester, End-Sem. Examination

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

Course Code: AUT1504 **Time: 2 Hour**

Course Name: Paint Shop Management **Max. Marks: 50 marks**

Instruction:

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

Section – A

10X01 = 10 Marks

Q-1. Which of the following variables does not affect the drying time of coating?

a. Air flow and movement
c. Type of substrate
b. Surface temperature
d. Solvent selection

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a. One
c. Three
b. Two
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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

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a. Primer
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b. Clear coat
d. All of the above

Q-10. What is the recommended distance between infrared lamp and panel?

a. 80mm
c. 80 cm
b. 100mm
d. 140cm

Section – B

04X04=16 Marks

Q-11. What will be the probable causes in Paint booth if the pressure inside the paint booth is too high? Write its remedies?

Ans There can be various reasons:-

1. Floor filters are choked so they will not allow the air to pass through.
2. Passage of exhaust air is blocked.
3. Exhaust blower is not working.
4. Variation in the speed of both the blowers

Q-12. Write the steps for color matching.

Ans:-

1. Inspect the damage.
2. Find the shade card of the color in natural day light.
3. Formulate the color.

4. Apply on flexible panels.
5. Match the panel with vehicle color.
6. If color does not match do the tinting or shading of the color.
7. Repeat the process until color does not match.

Q-13. Write the steps for Plastic painting of a new panel.

Ans:-

- Heat plastic parts for 60 minutes at +60°C object temperature
- Carefully clean with antistatic cleaner
- Heat plastic parts for 30 - 40 minutes at +60°C object temperature
- Lightly clean parts once more with antistatic cleaner
- Apply 1.5 coats of plastic primer / sealer
- Flash off time 5-10 mins
- Putty(for minor damages)
- Mix putty according to TDS and apply
- Drying:Air dry- 20-30 minutes at 20°C
- IR – 3 minutes short
- Sanding:first sanding second sanding Primer surfacer
- Blow parts with compressed air, lightly clean once more and wipe with a tack cloth
- mix the primer surfacer
- apply 1 tack coat followed by a normal full coat.
  Clean with degreaser and wipe with a tack cloth; blow part with compressed air (not with wet-on-wet application

- mix the base coat
- apply

a) 2.5 coats for metallic/two stage pearl colors = 15 - 20µm

b) 2.5 coats of under coat followed by 1.5-2 coats of basecoat for three-stage pearl colors = 40 - 45µm

- intermediate flash-off time: 5 - 10 minutes
- flash-off time before clear coat: 15 - 20 min.
- mix clear coat
- apply 1.5 coats of glossy / semiglossy / matt clear coat as per the need

Flash-off

- Oven Bake: according to TDS
- IR Drying: according to TDS

Q-14. Write the Parameters involved in cost estimation.

Ans. There are various parameters involved in estimation of cost.

1. Correct identification of paint damage.
2. Product knowledge which will be used in the repair.
3. Prices of the product consumed in the repair.
4. Quantity of the product required for the repair.

5. Facility charges should also be considered in the estimation.
6. Time required for the repair to calculate the labor charges and facility charges.

Section – C

04X06 =24 Marks

Q-15. Explain different types of borders used in masking.

- AnsThe area that separates the painted area from non-painted area is called a Border.
- It is important to select the border on the extent of repair and condition of old paint.

Borders for masking :-

1. Borders over gaps between panels.
2. Borders over body sealers.
3. Borders over crests of character lines.
4. Borders on the flat portion of panel

Q-16. What is the role of damper in the paint booth? What will happen if the damper does not function properly?

Ans The role of damper is to circulate the air in the paint booth.

a) during painting mode:-

When we turn on the painting mode, booth the damper stays in its original position which is closed and simply exhaust the air which comes from the inlet air.

b) During baking mode:-

In the baking mode we turn off the exhaust blower and the damper also opens and it helps to recirculate the air to enhance the baking process.

Q-17. Write the process for spot repair using metallic paint.

Ans:- Carefully clean with Prepsol

1. Make sure that the surfacer area is as small as possible.
2. sanding pad using P2000 wet grit paper
3. Blow parts with compressed air, clean with degreaser and wipe with a tack cloth
4. Mix Basecoat as per TDS
5. Apply basecoat:
6. until surfacer (damaged) area is fully covered by overlapping each coat slightly so a "dust zone" remains.
7. Prepare midcoat:-

   67% Binder XB165 and 33% thinner XB387

9 Prepare Blend in:-

Mix 50% Basecoat with 50% Midcoat and reduce pressure during fade out so a smooth transition is achieved

8. Mix clear coat as per TDS
9. Apply 2.5 coats extending basecoat area
10. Blend in:

Mix 50% Clearcoat with 50% Blending thinner and reduce pressure during fade out so a smooth transition is achieved.

11. Apply Blending thinner on over spray area.
12. If repair area is in middle or bigger than A4 size, apply Clear Coat on full panel
13. After drying polish the blend-in areas.

Q-18. Explain any four Paint application defects with its causes and remedies.

Ans:- 1.Runs

Causes:-

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

Incorrect choice of hardeners and thinners

Prevention:-

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

Remedies:-

- Sand and polish.
- Sand and repaint

2. **water spotting**

Causes:-

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

Prevention:-

- Follow application recommendations on technical data sheets

Remedies:-

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

3.**Clouding**

Causes:-

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

Prevention:-

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

Remedies:-

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

4. **sanding scratches**

Causes:-

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

Prevention:-

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

Remedies:-

- Thoroughly dry and sand.

  Isolate or remove substrate, repaint