BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Sp1 – A

Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. / ~~M. Voc.~~ Program, V th Semester,

1st In-Sem. Examination

Course Code: AUT 1501 **Time: 1 Hour**

Course Name: Automotive Mechatronic System **Max. Marks: 20**

Instruction: (a) All questions are compulsory.

(b) Marks for every question are given in Section wise.

Section – A

05X01 = 05 Marks

1. Charcoal filter helps in reducing _____ type of emission.

2. NOx emissions can be controlled by higher percentage of EGR

(a) True.

(b) False.

3. In a Bosch M3 the entry to starting phase starts when

(a) Insertion/ sensing of ignition key. (b) ECU gets signal from flywheel sensor

(c) ECU gets signal from throttle position sensor (d) Coolant temp reaches 60 degree C.

4. Dynamic skip fire is also known as

(a) Gas by wire (b) Electronic valve control.

(c) Cylinder de-activation. (d) VVT

5. Advance ignition timing causes

(a) Higher in-cylinder peak pressure. (b) Lower in-cylinder peak pressure.

(c) Higher peak temperature (d) Reduced volumetric efficiency.

Section – B

03X02 = 06 Marks

6. Write short note on VCR engines .

7. How do " reduced current draw" systems is a car engine help in achieving higher efficiency?

8. Write short note on thermal after burning.

Section – C

03X03 = 09 Marks

9. Why are lean -burn engines not encouraged ? Give at least two reasons with explanations.

10. Explain the operation of high efficiency super chargers and how electronics helps in overcoming the drawback of super charger?

11. How is the engine cold running phase controlled in Bosch M3?

School of Automotive Skills

Session 2020-21
B Voc V Sem
I Insem 'A' Set
AUT 1501 Mechatronics

1. Evaporative
2. ~~(b)~~ True
3. (b)
4. (c)
5. (a)

Section B

6. Conventional engines are fixed CR engines, but under different operating conditions of rpm and load, there is a requirement of different CR.

In an IC engine there is requirement of low CR when power is required and higher CR when more efficiency is desired.

There are various methods in which the volume of the cylinder or the stroke of the piston can be varied to achieve this.

The NISSAN Infiniti engine is one example where CR can be varied between 8:1 to 14:1.

7. About 2% of the overall energy in an IC engine is used up by various electrical systems. If these systems consume less power than the overall efficiency will improve.

Also, with more and more electronic components and sensors the requirement of electrical load

will keep on increasing.
All this requires power and if the electrical components draw less power the better it will be.
Another means will be not to have these systems "switched ON" always. Like an ABS can be switched on only after a certain speed

8. Before the use of catalytic converters, some vehicles used "After Burning" as a means of reducing pollutants in the exhaust
The aim was to reduce the hydrocarbon emissions from unburnt fuel.
If the fuel is made to burn after the cylinders, above 600°C then hydrocarbons an CO will produce H_2O and CO_2

SECTION-C

9. Lean-burn engines are the ones that work on very lean mixtures of around 20:1 or 22:1 or even more.
These engines produce high power with very little fuel and are thus very efficient.
So, if the engine has more air then there will not be any CO in the exhaust and all burning will lead to CO_2.
This is a good thing to have, i.e. reduced CO, but chemically CO is required in the

Exhaust for the following two reasons.

(a) To convert NO to $N_2 + CO_2$, so that the NO_x emission is less.

(b) To reduce HC by acting with the unburnt HC and converting to $CO_2 \& H_2O$.

e.g. $2C_2H_6 + 2CO \longrightarrow 4CO_2 + 6H_2O$.

10. Superchargers generally suffer from poor response at low engine rpm. Since conventional superchargers are positively driven from the engine they will be rpm dependent on the engine. Means if the engine rpm is more the supercharger will perform better and vice-versa. However, this will lead to loss of power at low rpm and high loads. Also, the emissions will be difficult to control.

Superchargers also consume large amount of power, if they increase the out put by x hp, they may consume 30% to 40% of this produced power.

High η superchargers consume less power, they are electrically operated and control the boost pressure by various inputs received by the ECU.

11. Engine cold running or warm-up phase is controlled by M3 in the following manner.

- ignition timing is corrected by taking reference first from coolant temp then by rpm and load.
- the injector open period is also increased to make up for fuel losses and drop in engine speed.
- enrichment factor is reduced
- also to overcome higher friction at low temp the air/fuel mixture supply is increased through a supplementary device which allows air to bye pass the throttle.

I

Set-A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 5th Semester,

1st In-Sem. Examination

Course Code: AUT1502 **Time: 1 Hour**

Course Name: Automotive Electrical System **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

05X01 = 05 Marks

Q1. The starter motor is driven by…

A. Chain drive
C. Gear drive
B. Flat belt drive
D. V-belt drive

Q2. In automobiles G.V.W. refers to…

A. Gross vehicle width.
C. Gross vehicle weight.
B. Gross vehicle wheel base.
D. Gross vehicle wheel track

Q3. What is the voltage rating of an electrical system in a passenger car?

A. 6 volts
C. 32 Volts
B. 12 volts
D. 48 volts

Q4. Which component of the electrical system keeps the battery charged?

A. The engine
C. The brakes
B. The alternator
D. The starter

Q5. A hydrometer is used to determine…

A. Relative humidity
C. Buoyancy force
B. Specific gravity of liquids
D. Viscosity of liquids

Section – B

03X02 = 06 Marks

Q6. What is the difference between active & passive sensor?

Q7. What is the function of a coolant temperature sensor?

Q8. Write down the possible reasons of knocking in an engine.

Section – C

03X03 = 09 Marks

Q9. Explain the working of a Hall effect sensor.

Q10. Explain three different types of sensors used in a car.

Q11. What are the advantages of an automotive Networking "Bus System"?

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Solution Set A

Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 5th Semester,

1st In-Sem. Examination

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Q5. A hydrometer is used to determine...

A. Relative humidity
C. Buoyancy force
B. **Specific gravity of liquids**
D. Viscosity of liquids

Section – B

03X02 = 06 Marks

Q6. What is the difference between active & passive sensor?

Ans. Active sensors have its own source of light or illumination. In particular, it actively sends a pulse and measures the backscatter reflected to the sensor. But passive sensors measure reflected sunlight emitted from the sun. When the sun shines, passive sensors measure this energy.

Q7. What is the function of coolant temperature sensor?

Ans. Coolant temperature sensors are used by the fuel management system to detect the engine's operating temperature. Depending on the sensor information, the control unit adapts the injection time and firing angle to the operating conditions. The sensor is a temperature sensor with a negative temperature coefficient.

Q8. Write down the possible reasons of knocking in an engine.

- Ans. Ignition point to early
- Fuel with to low octane number (91 octane)
- Engine overheating
- Compression ratio to high
- Incorrect mixture composition
- Engine overloading

Section – C

03X03 = 09 Marks

Q9. Explain the working of a Hall effect sensor.

Ans. Hall-effect sensors are the linear transducers that are used to measure the magnitude of the magnetic field. Working on the principle of Hall Effect, these sensors generate a Hall voltage when a magnetic field is detected, which is used to measure the magnetic flux density.

Working Principle of Hall Effect Sensor

The principle of Hall voltage is used as a working principle of the Hall Effect sensor. On a thin strip of a conductor, electrons flow in a straight line when electricity is applied. When this charged conductor comes in contact with the magnetic field which is in a perpendicular direction to the motion of electrons, the electrons get deflected. Some electrons get collected on one side while some on another side. Due to this, one of the conductor's plane behaves as negatively charged while the other behaves as positively charged. This creates potential difference and voltage is generated. This voltage is called the Hall voltage. The electrons continue to move from one side of the plane to other till a balance is achieved between the force applied on charged particles due to an electric field and the force that caused magnetic flux that caused this change. When this separation stops, the hall voltage value at that instant gives the measure of magnetic flux density.

Q10. Explain three different types of sensors used in a car.

Ans. Today's modern automobiles have a variety of sensors. You may hear of several of them such as: Throttle position sensor, TPMS sensor, ... These sensors built into their engine to ensure that the owner can identify and prevent possible issues before they result in breakdowns can result in expensive repairs.

a. The Mass Air Flow Sensor (MAF)

From different types of sensors used in cars, The Mass Air Flow Sensor (MAF) is a computer-controlled sensor that calculates the volume and density of the air taken in by the engine. This

in turn ensures the right amount of fuel is used for optimized operating conditions. If this sensor is faulty, the car may stall and the fuel usage will be higher than necessary.

b. The Engine Speed Sensor

The Engine Speed Sensor will help car owners control their cars better. Engine Speed Sensor is attached to the crankshaft and monitors the spinning speed of the crankshaft, which controls the fuel injection and timing of the engine. There are many ways for car engine to stop suddenly, and this sensor will prevent that for drivers.

c. Oxygen Sensor

The Oxygen sensor measures the amount of unburden oxygen that is present in the exhaust pipe and will indicate if the fuel is burning rich or lean. A faulty oxygen sensor will cause the car to idle poorly and jerk as well as cause high fuel consumption.

Q11. What are the advantages of an Automotive Networking "Bus System"?

Ans. **Advantages of "Bus-systems"**

- Low cost: Less wires required.
- Centralized: Allows central error diagnosis. (OBDII)
- Robust: Robust towards electric disturbances.
- Efficient: CAN frames are prioritized by ID.
- Flexible: Each CAN-connected ECU can receive all transmitted messages. And it allows easy modification and inclusion of additional nodes.

SET - A

11

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 5th Semester,

1st In-Sem. Examination

Course Code: AUT1503 **Time: 1 Hour**

Course Name: Workshop Management **Max. Marks: 20**

Instruction: Attempt all Questions.

Section – A

05X01 = 05 Marks

Q.1 ABC analysis deals with:

a. Analysis of process chart.
c. Ordering schedule of job.
b. Flow of material.
d. Controlling Inventory cost

Q.2 What amount of cost will C category items take of inventory budget?

a. 10%.
c. 50%.
b. 30%.
d. 80%.

Q.3 What is the full form of EHS?

a. Environment, health and safety.
c. Environment, home and surrounding.
b. Environment, human and safety.
d. Non of the above.

Q.4 What is the full form of OHS?

a. Occupation, health & safety.
c. Operational, health & safety
b. Occupational, health & safety
d. Non of the above.

Q.5 In 5S shine is about?

a. Making sure the paint on all new machines shines like sun.
c. Keeping the plant and tools always clean.
b. Making sure there is no dirt on the floor.
d. Workers should keep their shoes always shined.

Section – B

03X02 = 06 Marks

Q.6 Brief about inventory management policies.

Q.7 Describe employee responsibilities in maintaining the EHS.

Q.8 What is the requirement of 5S?

Section – C

03X03 = 09 Marks

Q.9 Write steps for fish bone root cause analysis and explain it with example.

Q.10. What is safety? Explain occupational safety, its importance and benefits.

Q. 11 Explain the electrical hazards and the steps to prevent them.

Solution Set-A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 5th Semester,

1st In-Sem. Examination

Course Code: AUT1503 **Time: 1 Hour**

Course Name: Workshop Management **Max. Marks: 20**

Instruction: (if any)

Section – A

05X01 = 05 Marks

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c. Ordering schedule of job.
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b. **Occupational, health & safety**
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c. Keeping the plant and tools always clean.
b. Making sure there is no dirt on the floor.
d. Workers should keep their shoes always shined.

Section – B

03X02 = 06 Marks

Q.6 Brief about inventory management policies.

Ans:

Each item should receive a treatment corresponding to its class:

A-items should have tight inventory control, more secured storage areas and better sales forecasts; reorders should be frequent, with weekly or even daily reorder; avoiding stock-outs on A-items is a priority.

B-items benefit from an intermediate status between A and C; an important aspect of class B is the monitoring of potential evolution toward class A or, in the contrary, toward the class C.

Reordering *C-items* is made less frequently; a typically inventory policy for C-items consist of having only 1 unit on hand, and of reordering only when an actual purchase is made; this approach

leads to stock-out situation after each purchase which can be an acceptable situation, as the C-items present both low demand and higher risk of excessive inventory costs.

Q.7 Describe employee responsibilities in maintaining the EHS.

Ans: **Responsibilities as an Employee**

As an **employee** you have a responsibility to highlight various problems in the working environment. You are the one who knows the most about your everyday work and how your working environment affects you and your work. You therefore have much to contribute to improving the working environment at university/organisation.

- What do you think needs to be improved and developed?

If you have any suggestions for improvements or would like to discuss problem areas, you can always contact your line manager, who is responsible for the working environment in your workplace, or the work environment representative. You can also contact either of the university's working environment coordinators.

Q.8 What is the requirement of 5S?

Ans.

5S stands for

SEIRI	Organisation/Sort out
SEITON	Orderliness/Systemize
SEISO	The Cleaning/Shining
SEIKETSU	Standardize
SHITSUKE	Sustain/ Discipline

5S began as part of the Toyota Production System (TPS), the manufacturing method begun by leaders at the Toyota Motor Company in the early and mid-20th century. This system, often referred to as Lean manufacturing in the West, aims to increase the value of products or services for customers. This is often accomplished by finding and eliminating waste from production processes.

Lean manufacturing involves the use of many tools such as 5S, kaizen, kanban, jidoka, heijunka, and poka-yoke. 5S is considered a foundational part of the Toyota Production System because until the workplace is in a clean, organized state, achieving consistently good results is difficult. A messy, cluttered space can lead to mistakes, slowdowns in production, and even accidents, all of which interrupt operations and negatively impact a company. By having a systematically organized facility, a company increases the likelihood that production will occur exactly as it should.

Section – C

03X03 = 09 Marks

Q.9 Write steps for fish bone root cause analysis and explain it with example.

Ans:

Steps of root cause analysis (1)

Put effect (= the major contributing factor) in the step 2 as "head of fish"; "Why (the contributing factor) happened?"

Draw heavy line from left to the effect on the center; "Backbone of fish"

Steps of root cause analysis (2)

Determine large category of cause according to your working environment

MSHEL group; Management, Software, Hardware, Environment

4M group; Man, Machine, Material, Method
Example of grouping of causes

Human: knowledge, skills health conditions, physical conditions etc.

Soft: system, methodologies, mechanism etc.

Hard: material, equipment, furniture, tools etc.

Environment: facility environment (water supply, electricity, smell, humidity etc.), working environment (work space, accessibility of materials, arrangement etc.)

Steps of root cause analysis (3)

Seek possible causes for the effect (the primary cause)

Categorize the primary cause into category

Avoid to mention to things in terms of "recourse shortage"

Steps of root cause analysis (4)

Narrow down cause(s) of each primary cause (the secondary cause)

Avoid to mention to things in terms of "resource shortage"

Steps of root cause analysis (5)

Find out "root causes" by asking "Why it is happening?" in enough time (recommended 5 times) for each possible causes listed on primary branch, and branch them into secondary, tertiary.

Q.10. What is safety? Explain occupational safety, its importance and benefits.

Ans: Definition – "The condition of being protected from or unlikely to cause danger, risk, or injury."
Or

"A device (as on a weapon or a machine) designed to prevent inadvertent or hazardous operation."

Meaning – Safety is the state of being "safe", the condition of being protected from harm or other non-desirable outcomes. Safety can also refer to the control of recognized hazards in order to achieve an acceptable level of risk.

Safety is the state in which the possibility of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management.

Occupational safety
Occupational safety, also commonly referred to as industrial safety or workplace safety (WHS), it is a multidisciplinary field concerned with the safety, health, and welfare of people at work.

Benefits of Safety

- Reducing injuries reduce costs to your business.
- Safe workers are loyal workers.
- Workers safety improves quality.

Importance of Safety
A serious workplace injury or death changes lives forever – for families, friends, communities, and co-workers too. Human loss and suffering is immeasurable. Occupational injuries and illnesses can provoke major crises for the families in which they occur.

In addition to major financial burdens, they can impose substantial time demands on uninjured family members. Today, when many families are operating with very little free time, family resources may be stretched to the breaking point.

Every person who leaves for work in the morning should expect to return home at night in good health. "Can you imagine the knock on the door to tell you your loved one will never be returning home?" Or "the phone call to say he's in the hospital and may never walk again? Ensuring that husbands return to their wives, wives to their husbands, parents to their children, and friends to their friends — that is the most important reason to create a safe work environment.

Q. 11 Explain the electrical hazards and the steps to prevent them.

Ans: An electrical hazard is a dangerous condition where a worker can or does make electrical contact with energized equipment or a conductor. Electrical or other sources of energy will be isolated and/or disconnected prior to beginning dismantle activities. Generators will be used for primary power source in the field. Low voltage electrical hazards can be prevented by insuring that all electrical tools, cords and plugs are approved for use and maintained free from defects or damage.
There are four main types of injuries: electrocution (fatal - □□□□), electric shock, burns, and falls.

Example of Electrical hazard - Hazards include: Loose or improper connections, such as electrical outlets or switches. Frayed (□□□□-□□□□□□) appliance or extension cords. Pinched or pierced wire insulation, which could occur from, for example, a chair leg sitting on an extension cord.

The main hazards with electricity are:

- Contact with live parts causing shock and burns.
- Faults which could cause fires.

Fire or explosion where electricity could be the source of ignition in a potentially flammable or explosive atmosphere, e.g. in a spray paint booth.

Preventative Steps and Safe Work:

- Inspect wiring of equipment before each use.
- Use safe work practices every time electrical equipment is used.
- Know the location and how to operate shut-off switches and/or circuit breaker panels.
- Limit the use of extension cords.
- Multi-plug adapters must have circuit breakers or fuses.

Electrical safety is a system of organizational measures and technical means to prevent harmful and dangerous effects on workers from electric current, electric shock, electromagnetic field and static electricity.

Set-A 11

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 5th Semester,

1st In-Sem. Examination

Course Code: AUT1504 **Time: 1 Hour**

Course Name: Paint Shop Management **Max. Marks: 20 marks**

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

05X01 = 05 Marks

Q-1. . Choose the best sample panels used for color matching.

a. Mixing stick
c. Steel panel
b. Paper of box
d. Old micro film

Q-2. Where is the pre-filter situated?

a. Exhaust blower
c. In the passage of inlet air
b. In the passage of exhaust air
d. None of the above

Q-3. What will happen if we rotate the direction of air cap of a spray gun by 90 degrees?

a. Spray pattern will also rotate by 90 degrees
c. Spray pattern will also rotate by 180 degrees
b. Spray pattern will also rotate by 45 degrees
d. None of the above

Q-4. What is the particle holding capacity of ceiling filters?

a. 10 microns and above
c. 100 microns and above
b. 50 microns and above
d. None of the above

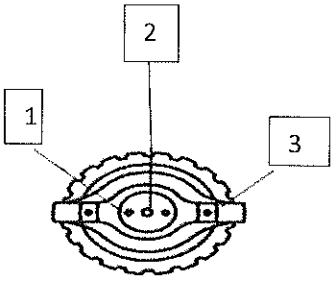
Q-5. Shelf life refers to.....

a. Drying time of product after mixing
c. Life time of product
b. Amount of time a 2-K product can be used after mixing of hardener
d. None of the above

Section – B

03X02 = 06 Marks

Q-6. Name the different types of holes and also mention their roles in the spray gun functioning.



Q-7. What is transfer efficiency? How it can be calculated?

Q-8. What is the role of damper in the paint booth? What will happen if the damper does not function properly?

Section – C

03X03 = 09 Marks

Q-9. Discuss the factors which effect the transfer efficiency of an air spray gun.

Q-10.Discuss about the maintenence of a paint booth.

Q-11. What are the probable cause in a paint booth if the blower is not starting? write its remedies

Solution Set-A

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Answer Key

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 5th Semester,

1st In-Sem. Examination

Course Code: AUT1504 **Time: 1 Hour**

Course Name: Paint Shop Management **Max. Marks: 20 marks**

Instruction:

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Section – A

05X01 = 05 Marks

Q-1. Choose the best sample panels used for color matching.

a. Mixing stick
b. Paper of box
c. Steel panel
d. Old micro film

Ans:- (c)

Q-2. Where is the pre-filter situated?

a. Exhaust blower
b. In the passage of exhaust air
c. In the passage of inlet air
d. None of the above

Ans:- (c)

Q-3. What will happen if we rotate the direction of air cap of a spray gun by 90 degrees?

a. Spray pattern will also rotate by 90 degrees
b. Spray pattern will also rotate by 45 degrees
c. Spray pattern will also rotate by 180 degrees
d. None of the above

Ans:- (a)

Q-4. What is the particle holding capacity of ceiling filters?

a. 10 microns and above
b. 50 microns and above
c. 100 microns and above
d. None of the above

Ans:- (d)

Q-5. Shelf life refers to.....

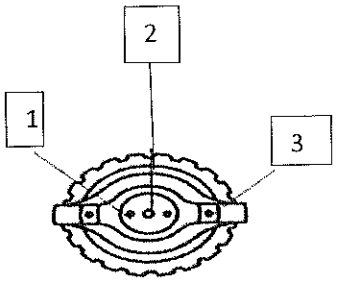
a. Drying time of product
b. Amount of time a 2-K product can be used after mixing of hardener
c. Life time of product
d. None of the above

Ans:- (c)

Section – B

03X02 = 06 Marks

Q-6. Name the different types of holes.



Ans:-1. Air atomizing holes

2. Centre air hole

3. Fan control air hole

Q-7. What is transfer efficiency? How we calculate it?

Ans:- It is defined as the ration of weight of solid coating deposited on the metal and the weight of solid coating provided for the application.

Weight of solid coating (gm):-

$$\frac{\text{Weight of liquid} \times \text{Weight of solids \%}}{100}$$

Q-8. What is the role of damper in the paint booth?

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.

Section – C

03X03 = 09 Marks

Q-9. Discuss the factors which effect the transfer efficiency of air spray gun.

- Ans
  - Part size
  - Part geometry
  - Gun-target distance
  - Coating viscosity
  - Ease with which coating can be atomized
  - Spray gun design and method of atomization
  - Fluid pressure

- Atomizing air pressure
- Fan size
- Overlapping of successive spray gun strokes
- Orifice diameter of spray gun cap
- Air velocity in the spray booth
- Air balance in the spray booth

Q-10.Discuss about the maintenence of paint booth.

Ans.The check up points for maintenance.

1. Power supply

2. Manometer

3. Cleaning of inside paint booth walls.

4, Filter replacement

a. Pre filter

b. ceiling filter

c. floor filter

5. cleaning of dryer units.

6 Lubrication

7. Cleaning of blowers.

Q-11. What will be the probable cause in Paint booth if bower is not starting and write its remedies?

Ans:- Causes:-

1.Air inlet blower is in off position.

2.No fuel in tank

3.Air lock in the fuel pipe.

4.Set temperature is less than ambient temperature.

5.No fuel supply due to fuel filter choked.

6.Timer shoeing the pre-set time.

Remedies:-

1.As a safety measure it is designs such that burner starts only when the air inlet blower is on.

2. Fuel to be filled.

3.Press reset.

4.Remove the fuel inward connection at burner and allow the air in the pipeline to goes out