Registration No.: .....

School of Automotive Skills

Session: 2019-20 (Summer Semester)

B. Voc. Program, ~~1st~~ 5th Semester,

1st In-Sem. Examination

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

Course Name: Mechatronics **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. Hydrocarbon emissions _____ with advance of ignition timings in an SI engine

A. Do not change
C. Increase
B. Decrease
D. None of the above

Q 2. Accuracy requirement of automotive sensors is generally of the order of

A. 3%
C. 0.4%
B. 1%
D. 7%

Q 3. Gasoline Direct Injection engines can work up to A: F ratios of:

A. 8:1
C. 65:1
B. 14.7:1
D. 96:1

Q 4. In a Motronic M3 system during acceleration phase enrichment will not occur above rpm of:

A. 500
C. 4000
B. 1300
D. 2700

Q 5. Oscillation Gyro meter type of sensor is used to measure

A. Amount of air intake
C. Throttle position
B. Cam shaft speed
D. Yaw rate

Section – B

03X02 = 06 Marks

Q 6. Write short note on Requirement of electronically controlled valve timing.

Q 7. Explain the steps of fuel: air calculations in a Bosch Motronic M3 System.

Q 8. What is Hall Effect and how is it applied in automotive sensors.?

Section – C

03X03 = 09 Marks

Q 9. What are the classification of automobile sensors and advantages of higher levels of integration in sensors?

Q 10. What is the construction of a Lambda sensor and how does a closed loop lambda control keeps the emissions under control?

Q 11. List out the various current technological trends in petrol engines and discuss cylinder de-activation process and its advantages.

11/9/19

SCHOOL OF AUTOMOTIVE SKILLS

Subject : AUT 1501
: Mechatronics

I - iii Sem Exam

SET A

Q 1. (c)
Q 2. (c)
Q 3. (c)
Q 4. (b)
Q 5. (d)

Q 6. Gas by Wire

In conventional cars the accelerator pedal is connected to the throttle by a steel cable. This system has limitations and is prone to damage under use.
Also, if the accelerator pedal is pressed fully suddenly, the throttle will open, but the engine will take time to respond.
In Gas-by-wire this connection is made electrically through a switch (relay) and solenoid at the throttle.
Even if the pedal is pressed fully suddenly the throttle valve will slowly open and response of engine will be smooth.
The system is more smooth and reliable.

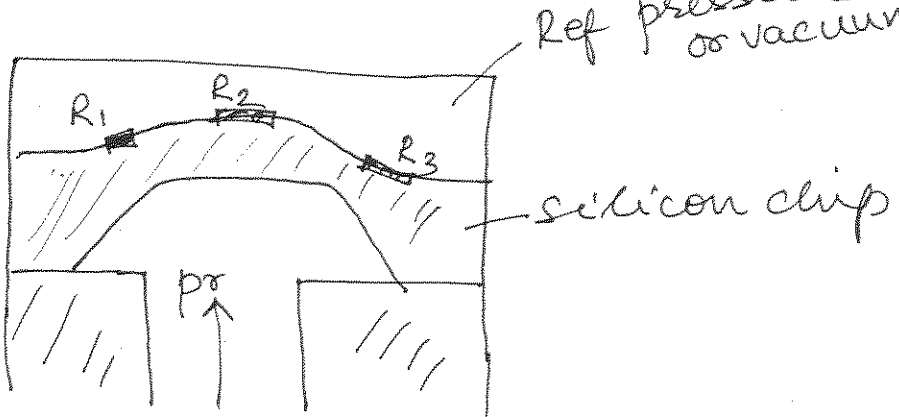
Q 7. Steps of F:A Calculations in Bosch M3

(a) F:A ratio is always to be maintained at stoichiometry. This is done by sensing the engine rpm and MAP.

(b) A sensor connected to inlet manifold through a pipe senses MAP, it's a piezoelectric type of sensor and fitted away from manifold so that it does not get influenced by pressure fluctuations.

(c) The density of air varies with temperature, so inlet air temp sensor, senses the temp and the ECU accordingly gives correction for amount of fuel to be injected. This is a NTC type of sensor.

Q 8.



This is used for pressures less than 6 bars generally.

- The measuring cell consists of a silicon chip in which a thin diaphragm is micromechanically etched.
- four resistors attached in a Wheatstone bridge are diffused on the diaphragm.
- the bridge voltage is a measure of the pressure on the diaphragm.

9: Hot wire Air Mass Meter

(a). This sensor has no moving parts and only has one wire made of metal like platinum whose resistance increases with temperature.

(b) The principle is that if more air flows over a hot wire, more heat will be taken away. OR to say if the wire was to be maintained at a temperature, the amount of power (voltage x current) supplied will be an indication of the mass of air flow over the wire.

(c) This gives a very accurate measurement of mass of air flow, however it cannot detect the direction of flow and thus air waves created due to sudden closing of the inlet valve may give little faulty reading.

(d) Also the oxides deposited on wire are to be cleared by heating it to 1000°C after every cycle of use.

This is an indirect method of measurement as the current is measured to detect the amount of air (mass) flow.

10. Acceleration Phase of Bosch M3

When rapid acceleration is detected by ECU from the rate of change of throttle potentio meter.

- enrichment occurs over a certain number of ignitions and not suddenly.
- enrichment factor is also controlled by coolant temperature and MAP
- the enrichment then decreases over a preset number of ignitions.
- enrichment applied for a calibrated number of ignitions and then reduced at a fixed rate until it is non-existant.
- Acceleration enrichment will not occur if the rpm is more than 5000 or the engine is at idle.

11. Various Sequences of MPFI System

(a) Continuous Injection.

(b) Intermitten Injection.

(i) Simultaneous.
(ii) Group (1 & 3, 2 & 4)
(iii) Sequence (1 → 2 → 3 → 4...)
(iv) Cylinder specific (as per firing order)

Drawbacks of MPFI are

(a) The efficiency is low as droplets may form at various places in inlet manifold or due to cold walls.

(b) There will be formation of wall applied film leading to loss of fuel.

(c) The fuel distribution to cylinders will be unequal depending on the design of inlet manifold.

(d) The MPFI have to operate at richer F:A ratios to cater to all these factors.

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

Session 2019-20, 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 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 system/component is NOT necessary to measure a value?

A. Sensor.
B. Wiring.
C. ECU.
D. CAN-Bus.

Q 2. A sensor is a device, module, or subsystem whose purpose is to..

A. ..send signals to another sensor.
B. .. operate an actuator.
C. ..detect events or changes in its environment.
D. ..control the resistance.

Q 3. What is a reason for a knocking combustion?

A. Ignition point to late.
B. Octane number in fuel too low.
C. Incorrect mixture (too lean).
D. Compression ratio not high enough.

Q 4. An oil pressure switch measures..

A. ..the exact oil pressure.
B. ..the oil temperature.
C. ..if there is pressure or not.
D. ..the oil level.

Q 5. What is the working principle of a map sensor?

A. Piezoelectric.
B. Hall principle.
C. NTC.
D. Induction.

Section – B

03X02 = 06 Marks

Q 6. For which systems/components is the coolant temperature signal used (name four)?

Q 7. What are the two main purposes of a Hot wire mass air flow sensor?

Q 8. What are the differences between Active (3Pin) and Passive (2Pin) Engine speed sensor (name 4 differences)?

Section – C

03X03 = 09 Marks

Q 9. Explain "main controlled variables" in detail, what happens if the signals are missing?

Q 10. Explain the purpose of "cold start enrichment" in detail, which sensor supplies the data for it?

Q 11. Explain why wideband oxygen sensors are used in modern vehicles (name 4 reasons), what are the differences to narrowband sensors (name two)?

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School of Automotive Skills
5th Semester, 1st In-Sem. Examination
B. Voc. Program, Summer Semester (2018-19)

Course Code: AUT1502 **Time: 1 hour**
Course Name: Automotive Hybrid Vehicle **Max. Marks: 20**

Section – A

Q 1. Which system/component is not necessary to measure a value?
Answer – D. Can-bus

Q 2. A sensor is a device, module, or subsystem whose purpose is to..

Answer – C. ..detect events or changes in its environment.

Q 3. What is a reason for a knocking combustion?
Answer – B. Octane number in fuel too low.

Q 4. An oil pressure switch measures..
Answer – C. if there is pressure or not.

Q 5. What is the working principle of a map sensor?
Answer – A. Piezoelectric.

Section – B

Q 6. For which systems/components is the coolant temperature signal used (name four)?
Answer –

- Activation of the cooling fan
- Activation of the electric water pump/ MAP controlled thermostat
- Temperature gauge
- Cold start enrichment

Q 7. What are the two main purposes of a Hot wire mass air flow sensor?
Answer –

- Measuring the exact amount of air which enters the engine
- Measuring the intake air temperature

Q 8. What are the differences between Active (3Pin) and Passive (2Pin) Engine speed sensor?
Answer – <u>ACTIVE:</u>

- Induction principle
- No power supply necessary
- Sinusoidal signal (sine wave)
- Less accurate

- <u>PASSIVE:</u>
- Hall principle
- Power supply necessary
- Square wave signal
- More accurate in low speed

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Section – C

Q 9. Explain "main controlled variables" in detail and what happens if the signals are missing?
Answer - Load and **engine Speed** are used to from the **basic injection quantity**. These quantities are known as MAIN CONTROLLED VARIBALES. Without these quantities the ECM cannot calculate the exact air/fuel ratio. If there is the load signal missing, the ECM will activate an emergency program. At this point the engine is barely running. Without the engine speed signal, the engine is not running usually.

Q 10. Explain the purpose of "cold start enrichment" and which sensor supplies the data for it?
Answer – An engine starting from cold will require an enriched fuel air mixture. This is to compensate for the condensation of the liquid fuel on the 'cold' surfaces in the intake tract and piston crown/combustion chamber and ensure that a combustible mixture is presented at the spark plug for first fire. If the fuel amount is not increased during cold start, the engine will not run. The coolant temperature sensor supplies the data.

Q 11. Explain why wideband oxygen sensors are used in modern vehicles and what are the differences to narrowband sensors (name two)?
Answer – 1. One of the main reason manufacturers are going to wideband sensors is because the heater channel comes up to operating temperature quicker — as fast as 10 seconds, in some cases. However, wideband sensors also need to be heated to higher operating temperatures to function effectively. While a narrowband sensor operates in the 300-400° C range, a wideband sensor needs to be heated to 600-800° C. The fast heating helps reduce emissions during cold starts and allows for improved fuel efficiency because the engine spends less time operating in open-loop mode. Some hybrids use the electrical circuit when the vehicle is in EV mode to heat the O2 sensors before the engine is called to duty, allowing 100 percent closed-loop operation. Modern engines run on a lean mixture and therefore a wideband sensor is required.

2. They precisely measure the amount oxygen in the exhaust rather than just switching between rich and lean.

3. They can be installed in modern Diesel engine and hybrid as well.

4. Wideband sensors are a lot faster acting in the reading then narrowband sensors

Differences:

1. Number of Pins (wideband 5pin, narroband 4pin)
2. Operating temp. much higher in wideband sensor
3. Wideband sensor reaches working temp much faster than narrowband sensors.

Registration No.: .....

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School of Automotive Skill

V Semester, 1st In-Sem. Examination

B. Voc. Program, Summer Semester (2019-20)

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

Course Name: Workshop Management **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 mark.
3. Answer all questions from section C, each question carries three mark.

Section – A

05X01 = 05 Marks

1. In 5S shine is about?
   a. Making sure the paint on all new machines shines like sun.
   b. Making sure there is no dirt on the floor.
   c. Keeping the plant and tools always clean.
   d. Workers should keep their shoes always shined.

   Ans. c. Keeping the plant and tools always clean.

2. ABC analysis deals with
   a. Analysis of process chart.
   b. Flow of material.
   c. Ordering schedule of job.
   d. Controlling Inventory cost.

   Ans. d. Controlling Inventory cost.

3. In 5S Sort is when you?
   a. Put all the big tools away from the technician.
   b. Is when you only have exactly what you need on the plant floor.
   c. Make sure all the tools are around the technician while working.
   d. Segregating the tools on the basis of their cost.

   Ans. b. Is when you only have exactly what you need on the plant floor.

4. What amount of cost will A category items take of inventory budget?
   a. 40%.
   b. 20%.
   c. 80%.
   d. 30%.

   Ans. c. 80%

5. Which of the following are characteristics of Break Even Point?
   a. There is no loss and no profit to the firm.
   b. Total revenue is equal to total cost.

c. Contribution is equal to fixed cost.
d. All of the above.

Ans. a. There is no loss and no profit to the firm.

Section – B

03X02 = 06 Marks

1. What does all S in 5S stands for?

   Ans.

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

2. What do mean by Red Tag in 5S? Explain its utility.

   Ans.

   Steps to do RED tagging:

   1. Ask staff to go through every item in the work place.
   2. Ask if needed & those that are needed, in what Quantity.
   3. Not needed RED TAG it and store in the RED TAG area.
   4. Place the suspected items in the RED TAG area for one week.
   5. Allow the staff to reevaluate the needed items.
   6. At the end of the week those who need items should be returned.

3. Explain Break Even Point.

   Ans.

   In simple words, the **break-even point** can be defined as a point where total costs (expenses) and total sales (revenue) are equal. Break-even point can be described as a point where there is no net profit or loss. The firm just "breaks even." Any company which wants to make abnormal profit, desires to have a break-even point. Graphically, it is the point where the total cost and the total revenue curves meet.

Section – C

03X03 = 09 Marks

1. What is ABC curve? Why it is used in Industry?

   Ans.

   ABC analysis is an ***inventory categorization method*** which consists in dividing items into three categories (A, B, C):

   - A being the most valuable items,
   - C being the least valuable ones.

   This method aims to draw managers' attention on the critical few (A-items) not on the trivial many (C-items).

2. Draw Bath tub curve and explain all the terminologies associated.

   Ans.

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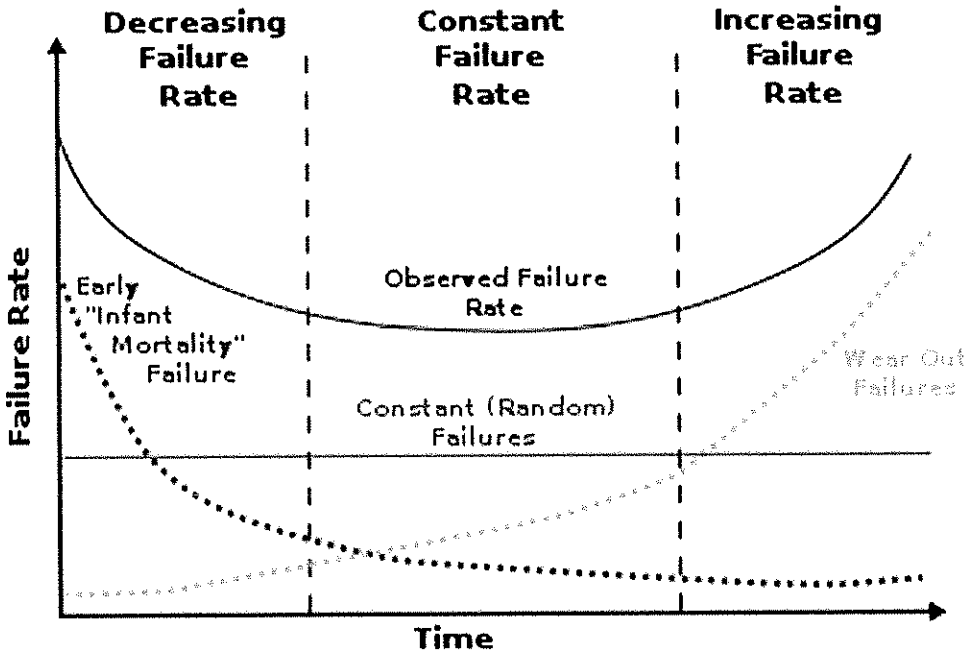

3. Categories the below mentioned items in ABC category using the fundamentals of ABC analysis.

Item number	101	102	103	104	105	106	107	108	109	110
Unit cost	5	11	15	8	7	16	20	4	9	12
Annual demand	48000	2000	300	800	4800	1200	18000	300	5000	500

Ans.

Item number	Cumulative % of items	Unit cost	Annual demand	Total cost per year	Usage as a % of total usage	Cumulative % of total
107	10%	20	18,000	360,000	48,8%	48,8%
101	20%	5	48,000	240,000	32,5%	81,3%
109	30%	9	5,000	45,000	6,1%	87,4%
105	40%	7	4,800	33,600	4,6%	92%
102	50%	11	2,000	22,000	3,0%	94,9%
106	60%	16	1,200	19,200	2,6%	97,5%
104	70%	8	800	6,400	0,9%	98,4%

110	80%	12	500	6,000	0,8%	99,2%
103	90%	15	300	4,500	0,6%	99,8%
108	100%	4	300	1,200	0,2%	100%
Total usage				737,900	100%	

Cathegory	Items	Percentage of items	Percentage usage (%)	**Action**
Class A	107, 101	20%	81,6%	Close control
Class B	109, 105, 102, 106	40%	16,2%	Regular review
Class C	104, 110, 103, 108	40%	2,5%	Infrequent review

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skill

V Semester, 1st In-Sem. Examination

B. Voc. Program, Summer Semester (2019-20)

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

Course Name: Workshop Management **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 mark.
3. Answer all questions from section C, each question carries three mark.

Section – A

05X01 = 05 Marks

1. In 5S shine is about?
   a. Making sure the paint on all new machines shines like sun.
   b. Making sure there is no dirt on the floor.
   c. Keeping the plant and tools always clean.
   d. Workers should keep their shoes always shined.

2. ABC analysis deals with
   a. Analysis of process chart.
   b. Flow of material.
   c. Ordering schedule of job.
   d. Controlling Inventory cost.

3. In 5S Sort is when you?
   a. Put all the big tools away from the technician.
   b. Is when you only have exactly what you need on the plant floor.
   c. Make sure all the tools are around the technician while working.
   d. Segregating the tools on the basis of their cost.

4. What amount of cost will A category items take of inventory budget?
   a. 40%.
   b. 20%.
   c. 80%.
   d. 30%.

5. Which of the following are characteristics of Break Even Point?
   a. There is no loss and no profit to the firm.
   b. Total revenue is equal to total cost.
   c. Contribution is equal to fixed cost.
   d. All of the above.

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Section – B

03X02 = 06 Marks

1. What does all S in 5S stands for?
2. What do mean by Red Tag in 5S? Explain its utility.
3. Explain Break Even Point.

Section – C

03X03 = 09 Marks

1. What is ABC curve? Why it is used in Industry?
2. Draw Bath tub curve and explain all the terminologies associated.
3. Categories the below mentioned items in ABC category using the fundamentals of ABC analysis.

Item number	101	102	103	104	105	106	107	108	109	110
Unit cost	5	11	15	8	7	16	20	4	9	12
Annual demand	48000	2000	300	800	4800	1200	18000	300	5000	500

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School of Automotive Skills

Session: 2019-20 (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. What is the effect on spray gun performance due to increase in number of air atomizing holes?

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

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

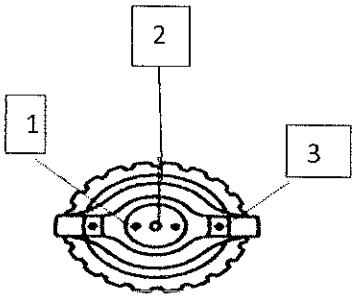
Q-5. Pot life refers to.....

a. Drying time of product
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 air spray gun.

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

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

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

5th Semester, 1st In-Sem. Examination

B. Voc. Program, Winter Semester (2019-20)

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

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

Ans:- (b)

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

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

Ans:- (a)

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

Ans:- (a)

Q-5. Pot life refers to.....

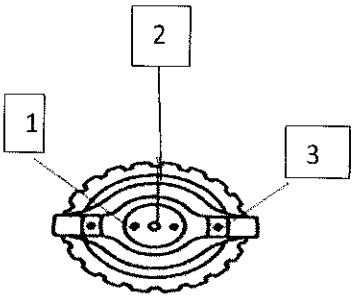
a. Drying time of product
c. Life time of product
b. Amount of time a 2-K product can be used after mixing of hardener
d. None of the above

Ans:- (a)

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