BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, VTh Semester,

1st In-Sem. Examination

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

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

Instruction: All questions are compulsory

Section – A

(choose the correct option) 05X01 = 05 Marks

1. NO^X emissions _____ with advance of ignition timings in an SI engine

(a) do not change. (b) decrease (c) Increase (d) None

2. Charcoal filter helps in reducing _____ type of emission

(a) Exhaust (b) Evaporative (c) NVH (d) Smell in passenger cabin

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

(a) 8:1 (b) 14.7:1 (c) 65:1 (d) 96:1

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

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

(c) ECU gets signal from (d) coolant temp reaches 60-degree C.

5. Cylinder de-activation is also known as

(a) Gas by Wire (b) Electronic valve control

(c) Dynamic skip-fire (d) VVT

Section – B

03X02 = 06 Marks

6. What all types of emissions are there from an engine, please describe.

7. Write short on variable compression ratio.

8. How does reduce 'reduce current draw' components help in operate car.

Section – C

03X03 = 09 Marks

9. How does electronic valve control help in efficient operation of engine.

10. Explain the steps of the handling of Acceleration phase by the BoschM3 Motronic system.

11. What are the components of "Mechatronics"? Explain in brief.

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Registration No.: .....

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, VTh Semester,

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Answer key

Course Code: AUT 1501 Time: 1 Hour

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(choose the correct option) 05X01 = 05 Marks

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(a) Gas by Wire (b) Electronic valve control

(c) Dynamic skip-fire (d) VVT

Section – B

03X02 = 06 Marks

6. What all types of emissions are there from an engine, please describe.

Ans. Nitrogen oxides generation ,

Carbon monoxide,

hydrocarbon

particulate

Particulate number

7. Write short on variable compression ratio.

Ans. Variable compression ratio is **a technology to adjust the compression ratio of an internal combustion engine while the engine is in operation**. This is done to increase fuel efficiency while under varying loads. Variable compression engines allow the volume above the piston at top dead centre to be changed.

8. How does reduce 'reduce current draw' components help in operate car.

Ans. ower the circuit's amperage by **adding a variable resistance device or increasing the resistance on any you already have in the circuit**. Variable resistance devices include transistors, FETs and rheostats, which are two-terminal variable resistors. Reduce the voltage in your circuit to lower the amperage.

Section – C

03X03 = 09 Marks

9. How does electronic valve control help in efficient operation of engine.

Ans. Electronic valve control (EVC) systems attempt to optimize the valve timing over the entire range of possible engine speeds. Most existing systems manipulate the valve timing using a computer controlled actuator attached to the camshaft. Sometimes two camshafts are used, one to control the intake valves and the other to control the exhaust valves. The camshaft may have two sets of lobes where one set is designed for low and the other for high RPMs. As the camshaft rotates, the lobes push open the spring-loaded valves, which are then closed by the force of springs. An electronic control unit (ECU) selects which set of lobes to use based on the engine speed. Another approach to variable valve timing employs a cam phasing mechanism to monitor and adjust the rotation of the camshaft relative to the rotation of the crankshaft.

10. Explain the steps of the handling of Acceleration phase by the BoschM3 Motronic system.

Ans. Motronic is a modification of the fuel injection system, which is also capable of controlling the distribution of ignition at the same time. It is part of the fuel system, and has three main groups of elements:

- Sensors of the state of the internal combustion engine and systems that affect its operation;
- Electronic controller;
- Executive mechanisms.

Sensors record the state of the motor and the nodes affecting its operation. This category includes the following sensors:

- DPKV;
- Detonation;

- Air consumption;
- Coolant temperature;
- Lambda probe;
- DPRV;
- Air temperature in the intake manifold;
- Throttle position.

11. What are the components of "Mechatronics"? Explain in brief.

Ans. The study of mechatronic systems can be divided into the following areas of specialty:

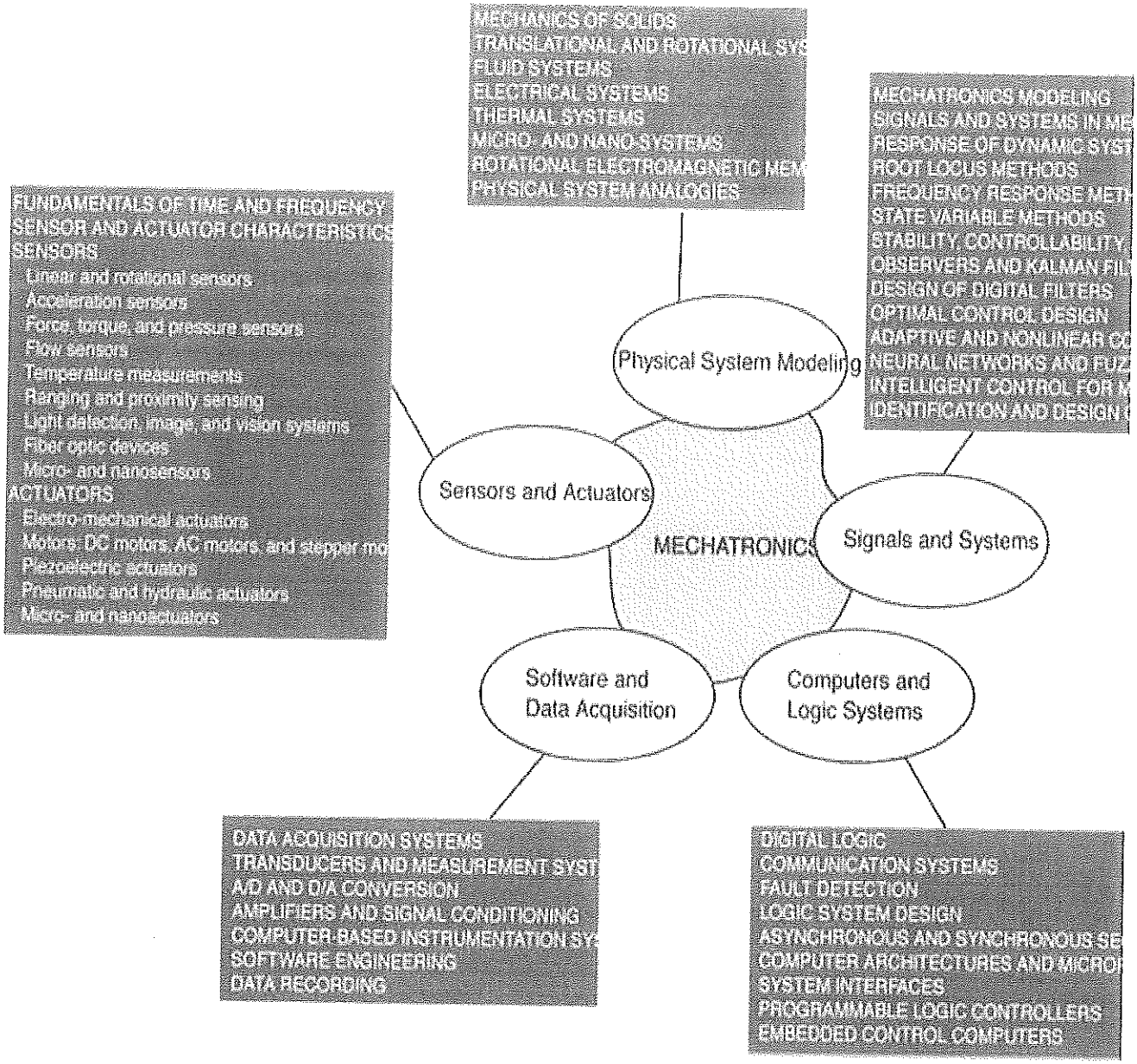
1. Physical Systems Modeling
2. Sensors and Actuators
3. Signals and Systems
4. Computers and Logic Systems
5. Software and Data Acquisition .

The key elements of mechatronics are illustrated. As the field of mechatronics continues to mature, the list of relevant topics associated with the area will most certainly expand and evolve.

Historical Perspective

Attempts to construct automated mechanical systems have an interesting history. Actually, the term "automation" was not popularized until the 1940s when it was coined by the Ford Motor Company to denote a process in which a machine transferred a sub-assembly item from one station to another and then positioned the item precisely for additional assembly operations. But successful development of automated mechanical systems occurred long before then.

For example, early applications of automatic control


MECHANICS OF SOLIDS
TRANSLATIONAL AND ROTATIONAL SYS
FLUID SYSTEMS
ELECTRICAL SYSTEMS
THERMAL SYSTEMS
MICRO- AND NANO-SYSTEMS
ROTATIONAL ELECTROMAGNETIC MEM
PHYSICAL SYSTEM ANALOGIES
MECHATRONICS MODELING
SIGNALS AND SYSTEMS IN ME
RESPONSE OF DYNAMIC SYST
ROOT LOCUS METHODS
FREQUENCY RESPONSE METH
STATE VARIABLE METHODS
STABILITY, CONTROLLABILITY,
OBSERVERS AND KALMAN FIL
DESIGN OF DIGITAL FILTERS
OPTIMAL CONTROL DESIGN
ADAPTIVE AND NONLINEAR CO
NEURAL NETWORKS AND FUZ
INTELLIGENT CONTROL FOR M
IDENTIFICATION AND DESIGN
FUNDAMENTALS OF TIME AND FREQUENCY
SENSOR AND ACTUATOR CHARACTERISTICS
SENSORS
Linear and rotational sensors
Acceleration sensors
Force, torque, and pressure sensors
Flow sensors
Temperature measurements
Ranging and proximity sensing
Light detection, image, and vision systems
Fiber optic devices
Micro- and nanosensors
ACTUATORS
Electro-mechanical actuators
Motors: DC motors, AC motors, and stepper mo
Piezoelectric actuators
Pneumatic and hydraulic actuators
Micro- and nanoactuators
Physical System Modeling
Sensors and Actuators
MECHATRONICS
Signals and Systems
Software and Data Acquisition
Computers and Logic Systems
DATA ACQUISITION SYSTEMS
TRANSDUCERS AND MEASUREMENT SYST
A/D AND D/A CONVERSION
AMPLIFIERS AND SIGNAL CONDITIONING
COMPUTER-BASED INSTRUMENTATION SY
SOFTWARE ENGINEERING
DATA RECORDING
DIGITAL LOGIC
COMMUNICATION SYSTEMS
FAULT DETECTION
LOGIC SYSTEM DESIGN
ASYNCHRONOUS AND SYNCHRONOUS SE
COMPUTER ARCHITECTURES AND MICRO
SYSTEM INTERFACES
PROGRAMMABLE LOGIC CONTROLLERS
EMBEDDED CONTROL COMPUTERS

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (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. A multimeter is able to measure...

A. Volt and Amps
B. Amps and Current
C. Volt, Resitance, Ohm
D. Volt, Amps and Ohm

Q2. A Voltmeter...

A. has no resistance
B. is used in serie
C. has about 10Megaohm
D. measures only AC

Q3. A sensor...

A. receives orders from ECU
B. needs always 12 volts
C. sends information to ECU
D. sends orders to ECU

Q4. The two most important information for the fuel injection are...

A. temperature and load
B. fuel pressure and rpm
C. load and rpm
D. voltage and load

Q5. Air consists of...

A. only oxygen
B. mostly NOx and oxygen
C. oxygen and CO_2
D. 78% nitrogen, 21% oxygen

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. What is the main reason to use an oscilloscope?

Section – C

03X03 = 09 Marks

Q9. Explain the meaning of OBD.

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

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

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Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Summer Semester)

B. Voc. Program, 5th Semester,

1st In-Sem. Examination

Answer key

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

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

Section – A

05X01 = 05 Marks

Q1. A multimeter is able to measure...

A. Volt and Amps
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C. Volt, Resitance, Ohm
D. Volt, Amps and Ohm

D. Volt, Amps and Ohm

Q2. A Voltmeter...

A. has no resistance
B. is used in serie
C. has about 10Megaohm
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C. has about 10Megaohm

Q3. A sensor...

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C. load and rpm

Q5. Air consists of...

A. only oxygen
B. mostly NOx and oxygen
C. oxygen and CO_2
D. 78% nitrogen, 21% oxygen

D. 78% nitrogen, 21% oxygen

Section – B

03X02 = 06 Marks

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

Active needs a power supply, mostly 12V, passive for ex. NTC or inductive not

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

Inform the ECU about the coolant temperature to adapt the mixture (NTC)

Q8. What is the main reason to use an oscilloscope?

Time! Fast signals or a signal changing over time, like fuel pressure.

Section – C

03X03 = 09 Marks

Q9. Explain the meaning of OBD.

On Board Diagnosis, all the time the running engine checks itself for malfunction.

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

NTC changing resistance depending on temperature, rpm producing a sinuswave-frequency depending on the revs, Lambda measuring the unburned oxygen in exhaust gas.

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

Low cost, faster communication, built-in-error-detection, robustness, flexibility, lightweight, better overview...

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skill

Session: 2021-22 (Summer Semester)

B. Voc., 5th Semester

1st In-Sem Examination

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. What does ABC stand for: -
   a. Always better control
   b. Anytime believe on car.
   c. According being control.
   d. None of the above.

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

3. At Break Even Point following is supposed to happen
   a. Profit
   b. Loss
   c. No Profit No Loss
   d. Profit = Loss

4. Which category provides the intermediate profit to business?
   a. "A".
   b. "B".
   c. "C".
   d. All of the above.

5. Fish bone analysis is being done for:
   a. Fish analysis
   b. Fishing hobby
   c. Problem solving
   d. Approach for problem solving.

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Section – B

03X02 = 06 Marks

1. What does fish bone analysis stand for? On what factors do it depends?
2. What is the requirement of 5S?
3. What do you mean by ABC analysis?

Section – C

03X03 = 09 Marks

1. Explain one problem with positive approach for solution with the help of fish bone diagram?
2. What do you mean by Break Even Point? Explain break even analysis.
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

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skill

Session: 2021-22 (Summer Semester)

B. Voc., 5th Semester

1st In-Sem Examination

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

Section – A

05X01 = 05 Marks

1. What does ABC stand for: -
   a. Always better control
   b. Anytime believe on car.
   c. According being control.
   d. None of the above.

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

Answer key –

3. At Break Even Point following is supposed to happen
   a. Profit
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   a. "A".
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   d. All of the above.

5. Fish bone analysis is being done for:
   a. Fish analysis
   b. Fishing hobby
   c. Problem solving
   d. Approach for problem solving.

Section – B

03X02 = 06 Marks

1. What does fish bone analysis stand for? On what factors do it depends?

Ans. **Fishbone diagram for Management**

- It is aimed for prevention of possible problem not yet occurred.
- It is also aimed to identify factor to be control. It does not need to ask why-because question

Fishbone diagram for Problem Solving

- It is aimed to find root causes of problem already occurred
- It is developed based on data and information obtained from Step 2
- Find root causes that are affecting the major contributing factor(s)

Put effect (= the major contributing factor) in the step 2 as "head of fish.
Draw heavy line from left to the effect on the center; "Backbone of fish"

2. What is the requirement of 5S?

Ans. problems do you commonly encounter at your workplaces?

1. Waiting
2. Motion
3. Transportation
4. Inventory
5. Rework
6. Over Processing
7. Over Prodcution
8. Demotivated Employees
9. Disordered/ Cluttered Environment
10. Mistakes/ Errors

3. What do you mean by ABC analysis?

Ans. The ABC approach states that a company should rate items from A to C, basing its ratings on the following rules:

- ***A-items*** are goods which annual consumption value is the highest; the top 70-80% of the annual consumption value of the company typically accounts for only 10-20% of total inventory items.
- ***B-items*** are the interclass items, with a medium consumption value; those 15-25% of annual consumption value typically accounts for 30% of total inventory items.
- ***C-items*** are, on the contrary, items with the lowest consumption value; the lower 5% of the annual consumption value typically accounts for 50% of total inventory items.

Section – C

03X03 = 09 Marks

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1. Explain one problem with positive approach for solution with the help of fish bone diagram?

Ans. When it comes to stock or inventory management, ABC analysis typically segregates inventory into three **categories** based on its revenue and control measures required. A is 20% of items with 80% of total revenue and hence asks for tight control, B is 30% items with 15% revenue, whereas 'C' is 50% of the things with least . ABC analysis is an inventory management technique **that determines the value of inventory items based on their importance to the business**. ABC ranks items on demand, cost and risk data, and inventory mangers group items into classes based on those criteria.

2. What do you mean by Break Even Point? Explain break even analysis.

Ans. A **breakeven analysis** is used to determine how much sales volume your business needs to start making a profit.

The breakeven analysis is especially useful when you're developing a pricing strategy, either as part of a marketing plan or a business plan.

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

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2021-22 (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. What is the lifetime of ceiling filters?

a. 2000 hours
c. 500 hours
b. 200 hours
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. The half press of spray gun trigger allows the.....

a. Paint and air discharge
c. Paint discharge
b. Air discharge
d. None of the above

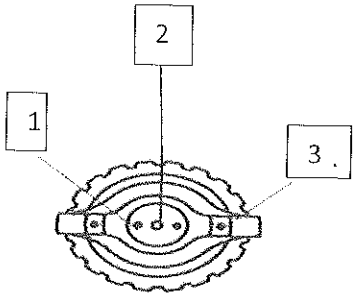
Q-5. Shelf life refers to.....

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. Write the working principle of air spray guns?

Q-8. What is transfer efficiency? How it can be calculated?

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 paint mixing room .

Q-11. What are the probable causes of increased pressure inside the paint booth? Write its remedies.

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Answer Key

School of Automotive Skills

Session: 2021-22 (Summer Semester)

B. Voc. Program, 5th Semester,

1st In-Sem. Examination

Course Code: AUT1504

Course Name: Paint Shop Management

Answer key -

Time: 1 Hour

Max. Marks: 20 marks

Instruction:

1. Answer all questions from section A, each question carries one mark
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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. What is the lifetime of ceiling filters?

a. 2000 hours
c. 500 hours
b. 200 hours
d. None of the above

Ans:- (a)

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. The half press of spray gun trigger allows the……

a. Paint and air discharge
c. Paint discharge
b. Air discharge
d. None of the above

Ans:- (b)

Q-5. Shelf life refers to…….

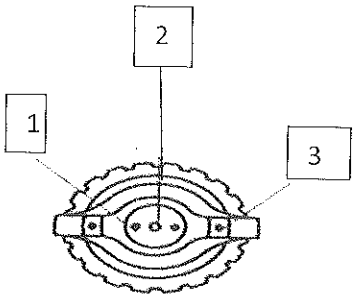
a. Drying time of product
c. Life time of product
b. Amount of time a 2-K product can be used after mixing of hardener
d. None of the above

Ans:- (c)

Section – B

03X02 = 06 Marks

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



Ans:- 1. Air atomizing holes

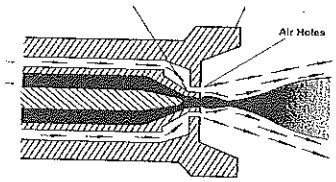
2. Centre air hole

3. Fan control air hole

Q-7. Write the working principle of air spray guns?

Ans:-The principle of spray-painting is the same as that of an atomizer. When compressed air is discharged from the air holes in the air cap, a negative pressure is created at the fluid tip, which in turn, applies suction to the paint in the cup.

This suctioned paint is then sprayed as atomized paint, due to compressed air at the holes in the air cap



Q-8. What is transfer efficiency? How it can be calculated?

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):-

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

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 paint mixing room .

Ans:- The paint mixing room is a place where we do the mixing of paints and we store the products and tools which we used in the painting.

Generally we have two exhaust fans in paint mixing room , one is upside and other one downside.

We have lot

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.