BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2019-20 (Summer Semester)

B. Voc. Program, Vth Semester,

End-Sem. Examination

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

Course Name: MECHATRONICS **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. Fuel balancing control in CRDI is also called:

(a) Zero delivery calibration (b) Smooth running control

(c) Pressure control (d) None of the above

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. In CRDI system the 'Common rail" acts as a separator between pressure generation and fuel injection:

TRUE/ FALSE

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.

The TCS gets activated when throttle input and engine torque are mismatched to road surface conditions:

TRUE/FALSE

8. In multiple injections in CRDI the Pre/ Pilot Injections lead to.....

(a) Reduce emissions
(b) Reduce NOx
(c) Reduce noise
(d) Reduce noise & NOx

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. In CRDI system explain the differences between high pressure side control and low pressure side control and advantages of high pressure side control.

12. What are the various methods of reducing engine power in TCS?

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

14. What is the logic used by any ECU in controlling actuators?

Section – C

04X06 = 24 Marks

15. Explain the Dynamic Brake Support and Crash Imminent Braking in AEB

16. What are the differences in Semi-automatic transmission and Fully Automatic transmission system? Explain with the requirement of application and use of vehicle

17. Explain Injector Delivery Compensation **OR** Zero Delivery Calibration in a CRDI System

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

Registration No.: .....

School of Automotive Skills

Session: 2019-20 (Summer)

B. Voc. Program, Vth Semester,

End-Sem. Examination

SET : "A" Answer Sheet

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

Course Name: MECHATRONICS **Max. Marks: 50**

Section – A

10X01 = 10 Marks

1. Fuel balancing control in CRDI is also called

(b) Smooth running control

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

(d) All of the above

3. What is the principle of application of canister purge

(b) Evaporation emissions

4. In CRDI system the 'Common rail" acts as a separator between pressure generation and fuel injection:

TRUE

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

(d) Non- contact .

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

(c) Vehicles Dynamics Management

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

TRUE

8. In multiple injections in CRDI the Pre/ Pilot Injections lead to.....

(d) Reduce noise & NOx

9. The main function of transmission system is to....

(a) Engine always operates in the best conditions

10. Hill descent control is a.....

d) Convenience function

Section – B

04X04 = 16 Marks

Q 11. In CRDI system explain the differences between high pressure side control and low pressure side control and advantages of high pressure side control.

Ans

In a high pressure side control the pressure regulator is on the high pressure side of the system. That is after the HP pump, generally on the common rail, and in some systems on the HP pump itself but on the high pressure side. The fuel not being utilised is routed back to the low pressure circuit.

Generally this flows upto the diesel tank and is discharged at the lower side in the tank as it is at high temperature and as it passes through the tank filled with diesel- it cools down.

In very high pressure systems (as the pressures could be up to 3000 bar) there may be a requirement of even having an inter-cooler to cool down the flow back diesel.

In low pressure side control the control mechanism is mounted on the input side of the HP pump and the pump sends high pressure fuel only as much as required by the injectors and the common rail system.

Advantages of High Pressure side control is that the system becomes very responsive to fluctuations in requirement of diesel by the injectors and thus the acceleration of the engine under load variation becomes very smooth.

Q 12. What are the various methods of reducing engine power in TCS?

Ans The various means of reducing engine power by TCS if the situation so demands are as under

(a) Suppression of spark in cylinder(s) as required.

(b) Reduction of fuel supply to cylinder or cylinders depending on the extent of reduction in power required.

(c) Closing the throttle if the vehicle is fitted with a " gas -by-wire" system.

(d) In case a turbo charger is fitted , a boost control solenoid is actuated to reduce the boost pressure and thus reduce engine power.

Q13. What are the differences between Active and Passive sensors? Explain with examples.

Ans The main difference between Active and Passive sensors is the requirement of power to run them.

Active sensors require power to perform their function and thus have to be switched on only when the ignition is turned on and have to depend on an electrical circuit also for functioning. Examples are hot film air mass sensor, vacuum pressure sensor.

Passive sensors are the ones which do not require power supply to perform their role and therefore no separate electrical circuit is to be provided to them. Examples ate NTC, pot meters.

Q 14. What is the logic used by any ECU in controlling actuators ?

Ans Any ECU has some pre- mapped data (set point values) of various operating conditions depending on the input value of various sensors that are connected to it. Within an ECU there may be more then one controllers to keep a check on each other for critical functions like Automatic Emergency Brakes etc.

The inputs from the driver are received by the sensors through the various methods like accelerator pedal sensor, the steering wheel angle sensor and also from other sensors which are not controlled by the driver. These could be lambda sensor and many more.

Now in the mapped data of ECU there are parameters which match the driver input and the other inputs to output parameters like wheel speed and try to identify mismatch. In case a mismatch is detected the signal is sent to the specific sensor to correct the mismatch.

For example the ESP gets various inputs and detects whether the instability is created due to a driver input (may also be rate) or road input and send signal to the appropriate actuator to correct it.

The systems could be open loop or closed loop.

Section – C

04X06 = 24 Marks

Q15. Explain the Dynamic Brake Support and Crash Imminent Braking in AEB

Ans. In an AEB(Automatic emergency brake) System there is a requirement of avoiding collision with the vehicle ior any other object like a pedestrian, a baby stroller etc. in front when the driver is not been able to apply brakes or adequate brakes, by intelligent application of brakes. There are various conditions and features that are available in such a system depending on the type of vehicle.

The collision may occur due to any or both of the following reasons

(a) The driver does apply brakes but has misjudged or panicked and the brake pressure is inadequate.

(b) The driver has panicked or dozed off or the attention has been diverted and has not applied brakes at all.

Under the circumstances when adequate brake pressure is not applied the system applies brakes harder and this support from the AEB is called **Dynamic Brake Support**

Under the condition that the driver has not applied brakes at all the AEB applies brakes and this support is called **Crash Imminent Braking.**

Q 16. What are the differences in Semi-automatic transmission and Fully Automatic transmission system? Explain with the requirement of application and use of vehicle

Ans. A semi automatic transmission is one in which all functions of a manual transmission are carried out automatically. To explain in detail a manual transmission has the following steps when gears are shifted

(a) The driver presses the clutch to dis-engage the engine from the transmission.

(b) The driver operates the gear lever and dis-engages the present gear- keeping the clutch pressed.

(c) The driver then engages the required gear keeping the clutch pedal pressed.

(d) The driver then releases the clutch pedal to re-engage the engine to the transmission.

During these steps the torque from the engine is not getting transmitted to the wheels. There are certain requirements in some vehicles like ATVs, or high end cars as this loss of torque and dis-engagement-- engagement cycle leads to momentary loss of power at the wheels and a jerk.

In an fully automatic transmission there is no dis-engagement of the transmission from the engine and the running is smooth. An example of this type of transmission is a CVT.

Q 17. Explain Injector Delivery Compensation **OR** Zero Delivery Calibration in a CRDI System

Ans.

Injector Delivery Compensation: Every injector assembly has various components like the plunger, injector nozzle, some electrical components, passages for flow of diesel and many more. These all are manufactured with high precision but surely have manufacturing tolerances which make each one different from the other.

This difference will lead to difference in performance thus when the injectors are integrated with the EDC and rest of the components of the CRDI the data of the injector manufacturing is loaded on the ECU. This may include many information like "lift behaviour", injection pattern etc

This data is very essential to maintain the correct injection pattern and pressure otherwise the performance of the cylinder will be affected and lead to force imbalance and emissions. The ECU then adjusts the metering and switching accordingly.

OR

Zero Delivery Calibration

For control of noise and emissions it is important that the pre-injections are controlled. Thus over a period of time with usage and wear and tear of the injectors the injector-fuel drift is to be monitored. To monitor that small pre-injections are done after a set time in each cylinder (not noticeable by the driver) under over run conditions and its impoact in noted by the ECU, like torque, inputs from lambda sensor etc.

Under different operating conditions the process is repeated and data stored by ECU. This then enables the ECU to make adjustments accordingly.

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

Ans. The various sequences of injection that are possible in an MPFI system are:

(a) Continuous injection- the fuel pressure always keeps the valve open as long as the engine is running.

(b) Intermittent injections- Electro-magnetically opened only for a short period

(I) Simultaneously means all injectors open at the same time but only half the quantity is injected per crankshaft revolution.

(ii) Group- injection may be in group of injectors like 1 & 3 or 2& 4 are opened once per power cycle.

(iii) Sequential : as per firing order but still in the manifold only.

(iv) Cylinder specific: as per firing order but close to the specific cylinder.

The Disavdantages of MPFI are

(I) Cold manifold walls lead to droplet formation and loss of efficiency.

(ii) Formation of wall -applied film.

(iii) Unequal fuel distribution to cylinders.

(iv) Due to these losses the engines have to operate at richer mixtures and thus lead to pollutants.

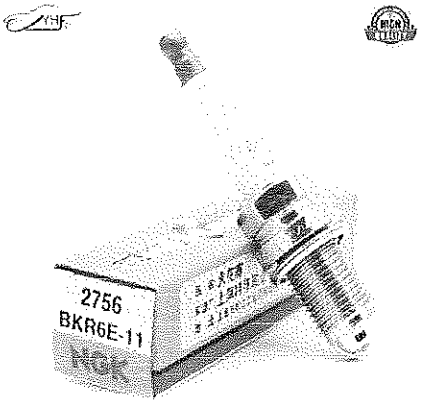
----------XXXXXX----------XXXXXX----------

Q 6. Which of the following statements is wrong?

A. In India Platinum spark plugs are mainly used in high-end engines/cars (e.g. BMW, Jaguar).
B. Platinum spark plugs last for approximately 150'000km.
C. Platinum spark plugs have a similar structure like "ordinary" spark plugs except for the platinum tipped center and ground electrode.
D. Platinum spark plugs can be changed with "regular" spark plugs during maintenance.

Q 7. In BKR6E-11, what is the meaning of figure number 6?

	NGK	PULSTAR	DENSO	CHAMPION	BOSCH
HOTTER	2		9	18, 19	10
	4	1	14	14, 16	9
	5	1	16	11, 12	8
	6	1	20	9, 10	6, 7
	7	1	22	7, 8	5
	8	2	24	6, 61, 63	4
	9	2	27	4, 59	3
	9.5		29	57	
	10		31	55	2
	10.5		32	53	
	11		34		
	11.5		35		
COLDER	12		37		



A. Gap distance for the ground electrode.
B. Just a part number without a specific meaning.
C. This spark plug is designed for a six-cylinder engine.
D. The heat range of the spark plug.

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. What is the meaning of LUMEN and KELVIN?

A. Lumen: Measures the "brightness" of light source. Kelvin: Describe the color temperature of a light source.
B. Lumen: Describe the color temperature of a light source. Kelvin: Measures the "brightness" of light source.
C. Lumen: Is the measure of the brightness at a particular location. Kelvin: Measures the power emitted by a light source.
D. Lumen: Measures the power emitted by a light source. Kelvin: Is the measure of the brightness at a particular location.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2019-20 (Summer / Winter Semester)

B. Voc. Program, 5 Semester,

End-Sem. Examination

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

Course Name: Automotive Electrical Systems **Max. Marks: 50**

Instruction:

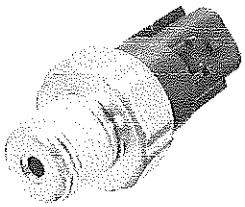
Section – A

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 10. The thermal management plays a decisive role in the use of LEDs in headlamps, as these component parts react very sensitively to heat. Which system is least used in the automobile industry to maintain the optimal working temperature?

A. Finned heat sink.
B. Pin heat sink.
C. Cooling fan.
D. Fluid cooling.

Section – B

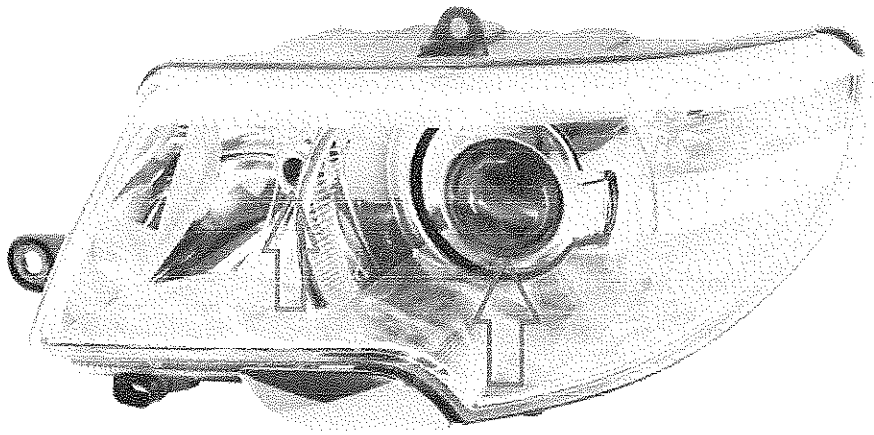
04X04 = 16 Marks

Q 11. Which two signals are essential for any engine to run properly? Name two devices for each of these signals, which are capable of measuring the specific value?

Q 12. More and more cars are equipped with wideband oxygen sensors instead of narrow band oxygen sensor. Write two differences between these two sensors and name two advantages of a wideband sensor.

Q 13. One part of a modern automotive lighting architecture is called "adaptive light system". Explain two types of adaptive light systems.

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.

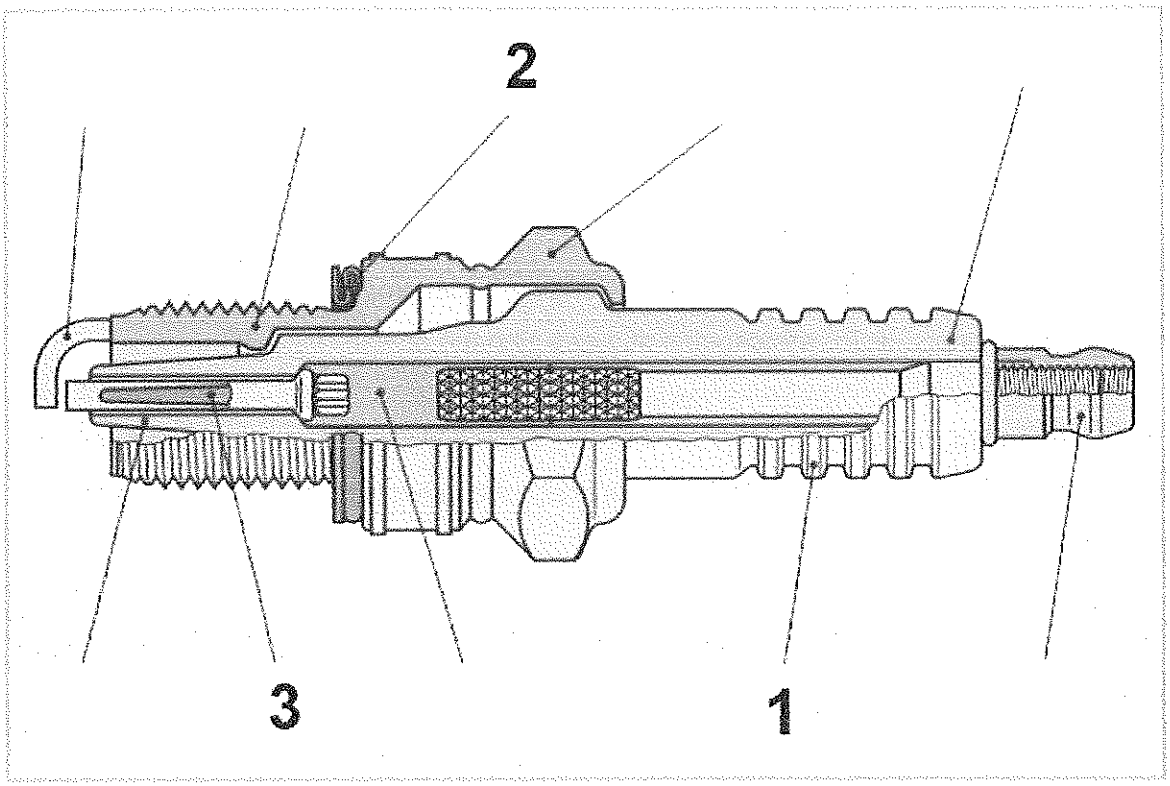


A B

Section – C

04X06 = 24 Marks

Q 15. What are the names of the parts labelled as 1,2 and 3 in the given picture? Explain the function of these parts in detail.



Q 16. Explain the differences between "hot" and "cold" types of spark plugs. Also explain the consequences when you install the wrong type of spark plug.

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 him with six different reasons why these systems are crucial today.

Q 18. The latest development in automotive lighting technology is called Matrix-LED. Explain the Matrix-LED technology and name two major advantages compare to an ordinary halogen light system also name two additional devices, apart from the lighting, system which are mandatory for a proper function of the Matrix-LED system.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2019-20 (Summer / Winter Semester)

B. Voc. Program, 5 Semester,

End-Sem. Examination

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

Course Name: Automotive Electrical Systems **Max. Marks: 50**

Instruction: (if any)

Section – A

10X01 = 10 Marks

10 objective type questions, each question carries 01 mark.

Section – B

04X04 = 16 Marks

04 short answer type questions, each question carries 04 marks.

Section – C

04X06 = 24 Marks

04 long type questions, each question carries 06 marks.

Section – A

Q 1. B
Q 2. D
Q 3. C
Q 4. B
Q 5. B
Q 6. A
Q 7. D
Q 8. D
Q 9. B
Q 10. A

Section – B

Q 11. LED; door mirror turn signal light, foot light, theft deterrent light

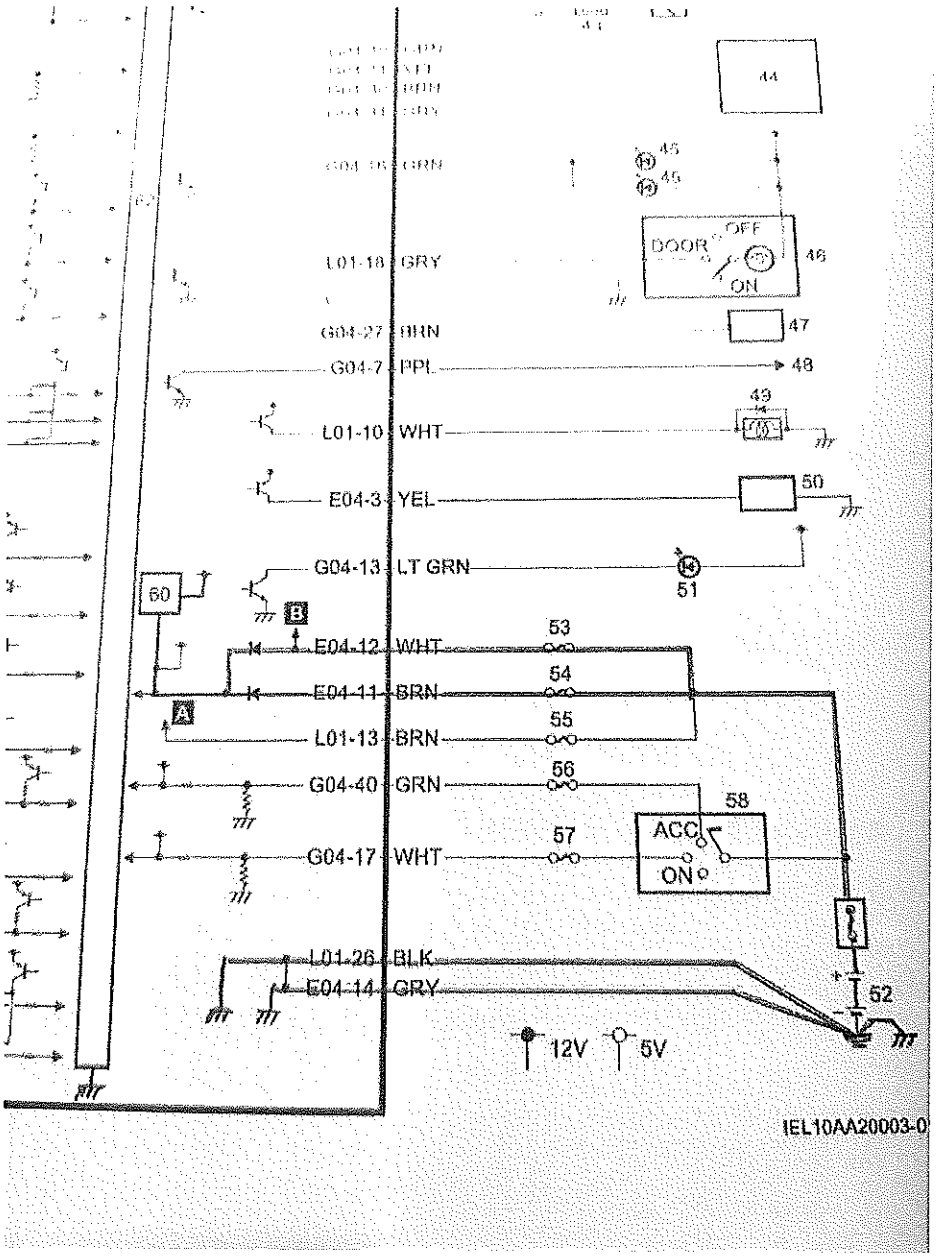
Q 12. With this configuration you can open the driver side only or all the doors. You can operate the driver side door independently.

Q 13.

Electrically, 41 trunk lid opener actuator, 10 trunk lid request switch, 11 trunk lid unlatch switch, 21 trunk lid switch

If these devices fail: In most modern cars there is a whole in the trunk cover (inside the car) which you can operate manually. In case of a broken trunk lid actuator you have to open it manually from inside.

Q 14. See picture below.



The working voltage of the CPU (inside the BCM) is 5V. The devices involved for the power supply are: battery (52), wires, fuse, power supply circuit (60) ground point inside the BCM and the ground point on the car.

Section – C

Q 15.

A. reasons

- Mixture too rich
- wrong spark plug cold type instead of hot type
- vehicle only driven for short distances

B. reasons

-wrong spark plug hot instead of cold type

-knocking combustion

-mechanical damage in the engine

A. solution

-check and install the right spark plug

-check the injection system for the right mixture (ect sensor)

-ask the customer about his/her driving style. Tell them to drive the car for longer distances

B. solution

-check and install the right spark plug

-check for knocking combustion, check spark timing

-inspect the engine for mechanical damages (pistons, valves, combustion chamber, timing)

Q 16. **Single spark**

In such engines only a spark plug performs the ignition for each cylinder. The ignition system is controlled and operated by electronic control unit that may call as CDI or ECU

+Construction and operation of single spark ignition engine is comparatively easier.

Twin spark

In twin spark ignition each cylinder contains two different spark plugs which ignite simultaneously or sparks with different timing.

+ Efficient and optimum level of combustion is ensured in double spark ignition.

Double "waste" spark

Wasted spark ignition systems are a type of DIS, which uses one coil for every two cylinders. The coil provides the spark for one of the paired cylinders on the compression stroke and to the other on the exhaust stroke. Because the coil fires the spark plug on the exhaust stroke as well, it is appropriately named 'wasted spark ignition'. In effect, the spark plugs fire simultaneously and twice as often.

+In a four-cylinder engine there are only two spark coils required so the number of spark coils can be reduced

Q 17.

-Number of ECU's have increased heavily in recent years and they all depend on each other

-Reliable system

-Easy to add more ECU's

-Robust towards electrical disturbance

-Easier to diagnose (OBD)

-Lower costs, less wires required

-Efficient ID's can be prioritized

Q 18.

Light dark boundary: makes sure that the light is "directed" to the right place. Means that in low beam the light should illuminate the road in the most efficient way without blinding the oncoming traffic.

- Is the car standing on a flat surface?
- Is the tire pressure correct?
- Is the car "empty"?
- Are the headlamps in a good condition
- Is the "Light-level in the right position (0 or -)
- Is the aligner standing parallel to the car?
- Is the aligner adjusted to the correct hight?
- Is the aligner leveled?
-

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2019-20 (Summer Semester)

B. Voc. Program, 5th Semester,

End-Sem. Examination

Course Code: AUT1503 **Time: 2 Hours**

Course Name: Workshop Management **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. As per the child labor (Regulation & Abolition) Act, child means a person who has not completed his:
a. Eighteen years of age
b. Fourteen years of age
c. Sixteen years of age
d. Twenty one years of age

Q.2. Which of the following is not a quantitative forecasting method?
a. Time Series
b. Causal Relationship
c. Delphi method
d. Simulation

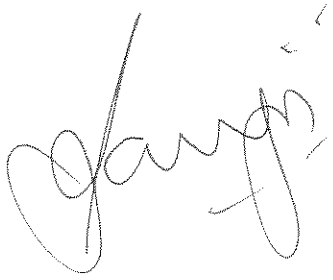
Q.3. ISO 9000 provide standards for:
a. Quality management
b. Environmental management
c. Food safety management
d. Energy management

Q.4. Which of the following will have the maximum reliability?
a. A component with 100 parts
b. A component with 1000 parts
c. A component with 50 parts
d. A component with 150 parts

Q.5. At Break Even Point following is supposed to happen:
a. Profit
b. Loss
c. No Profit No Loss
d. Profit = Loss

Q.6. Fish bone diagram is also known as:
a. Cause and effect chart.
b. Ishikawa diagram.
c. Both a and b.
d. None of the above.

Q.7. Which type of chart uses the rule of 20:80?
a. Cause and effect chart.
b. ABC chart.
c. Fish bone diagram.
d. Control chart.



Q.8. Bath tub curve represents failure rate of:
a. Entire population of the products over time
b. First 10 samples produced out of the production line
c. Sample chosen by sampling technique
d. All of the above.

Q.9. Failure rate is defined as:
a. Rated life of part in hours/ Actual working of part in hours.
b. Mean Life/ Actual life.
c. No. of parts failed/ total hours of testing time.
d. Down time/ up time.

Q.10. In an organization, to become eligible for maternity leave as per maternity benefit act, 1961 a woman employee should have worked for atleast:
a. 80 days
b. 100 days
c. 120 days
d. 140 days

Section – B

04X04 = 16 Marks

Q.1. Explain payment of wages Act, 1936 in detail.

Q.2. What is MFE & MAD? Differentiate between them.

Q.3. How does ISO develop standards and what are the key principles in standard development?

Q.4. Differentiate between Reliability and Maintainability.

Section – C

04X06 = 24 Marks

Q.1. Draw Ishikawa diagram and mention its utility.

Q.2. What is the highest failure rate for a product if it is having probability of survival of 95% at 4000 hours? Assume that the time to failure follows an exponential distribution.

Q.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

Q.4. Draw Bath tub curve and explain all the terminologies associated with it.

(A)

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2019-20 (Summer Semester)

B. Voc. Program, 5th Semester,

End-Sem. Examination

Course Code: AUT1503 **Time: 2 Hours**

Course Name: Workshop Management **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. As per the child labor (Regulation & Abolition) Act, child means a person who has not completed his:
a. Eighteen years of age
b. Fourteen years of age
c. Sixteen years of age
d. Twenty one years of age
Ans. b. Fourteen years of age

Q.2. Which of the following is not a quantitative forecasting method?
a. Time Series
b. Causal Relationship
c. Delphi method
d. Simulation
Ans. c. Delphi method

Q.3. ISO 9000 provide standards for:
a. Quality management
b. Environmental management
c. Food safety management
d. Energy management
Ans. a. Quality management

Q.4. Which of the following will have the maximum reliability?
a. A component with 100 parts
b. A component with 1000 parts
c. A component with 50 parts
d. A component with 150 parts
Ans. c. A component with 50 parts

Q.5. At Break Even Point following is supposed to happen:
a. Profit
b. Loss
c. No Profit No Loss
d. Profit = Loss
Ans. d. No Profit No Loss

Q.6. Fish bone diagram is also known as:
a. Cause and effect chart.
b. Ishikawa diagram.
c. Both a and b.
d. None of the above.
Ans. "c". Both a and b

Q.7. Which type of chart uses the rule of 20:80?
a. Cause and effect chart.
b. ABC chart.
c. Fish bone diagram.
d. Control chart.
Ans. ABC chart

Q.8. Bath tub curve represents failure rate of:
a. Entire population of the products over time
b. First 10 samples produced out of the production line
c. Sample chosen by sampling technique
d. All of the above.
Ans. a. Entire population of the products over time

Q.9. Failure rate is defined as:
a. Rated life of part in hours/ Actual working of part in hours.
b. Mean Life/ Actual life.
c. No. of parts failed/ total hours of testing time.
d. Down time/ up time.
Ans. c. No. of parts failed/ total hours of testing time.

Q.10. In an organization, to become eligible for maternity leave as per maternity benefit act, 1961 a woman employee should have worked for atleast:
a. 80 days
b. 100 days
c. 120 days
d. 140 days
Ans. 80 days

Section – B 04X04 = 16 Marks

Q.1. Explain payment of wages Act, 1936 in detail.

Ans.

Applicability - Employees/workers drawing salary lesser than 24 thousand rupees gross.

Payment of wages - When less than 1000 persons are employed at a site, wages shall be paid before the expiry of the 7th day of the following month. When more than 1000 workers are employed at a site, wages shall be paid before the expiry of the 10th day of the following month.

Mode of Payment - All wages should be credited in employee's bank account or paid by cheque, after obtaining an authorization.

Notice to be displayed, showing rates of wages, hours of work, wage period, dates of payment, names and addresses of the inspector and to send a copy to the inspector.

Deductions on Wages - Deductions such as, fine, deduction for amenities and services supplied by the employer, advances paid, over payment of wages, loan granted for house-building or other purposes, income tax payable in pursuance of the order of the Court, PF contributions, cooperative societies, premium for Life Insurance, contribution to any fund constituted by employer or a trade union, recovery of losses, ESI contributions etc. should not go beyond 50 % of one's gross salary

Displays - Display abstract of act in English and regional language.

Returns – File annual returns within its due date by 15th February

Q.2. What is MFE & MAD? Differentiate between them.

Ans.

MFE stands for Mean Forecast Error (Bias). It is the average error in the observations and a more positive or negative MFE implies worse performance; the forecast is biased.

$$\text{MFE} = \frac{\sum_{i=1}^{n} A_i - F_i}{n}$$

MAD stands for Mean Absolute Deviation. It is the average absolute error in the observations and Higher MAD implies worse performance. If errors are normally distributed, then $\sigma\varepsilon=1.25\text{MAD}$

$$\text{MAD} = \frac{\sum_{i=1}^{n} |A_i - F_i|}{n}$$

Q.3. How does ISO develop standards and what are the key principles in standard development?

Ans.

ISO standards are developed by a panel of experts, within a **technical committee**. Once the need for a standard has been established, these experts meet to discuss and negotiate a draft standard. As soon as a draft has been developed it is shared with ISO's members who are asked to comment and vote on it. If a consensus is reached the draft becomes an ISO standard, if not it goes back to the technical committee for further edits.

Key principles in standard development

1. ISO standards respond to a need in the market

- ISO does not decide when to develop a new standard. Instead, ISO responds to a request from industry or other stakeholders such as consumer groups. Typically, an industry sector or group communicates the need for a standard to its national member who then contacts ISO. Contact details for national members can be found in the list of members.

2. ISO standards are based on global expert opinion

- ISO standards are developed by groups of experts from all over the world that are part of larger groups called technical committees. These experts negotiate all aspects of the standard, including its scope, key definitions and content.

3. ISO standards are developed through a multi-stakeholder process

- The technical committees are made up of experts from the relevant industry, but also from consumer associations, academia, NGOs and government.

4. ISO standards are based on a consensus

- Developing ISO standards is a consensus-based approach and comments from stakeholders are taken into account.

Q.4. Differentiate between Reliability and Maintainability.

Ans.

Reliability is defined to be the probability that a component or system will perform a required function for a given period of time when used under stated operating conditions.

In engineering **maintainability** is the ease with which a product can be maintained in order to correct defects or their cause, repair or replace faulty or worn-out components without having to replace still working parts, prevent unexpected working condition.

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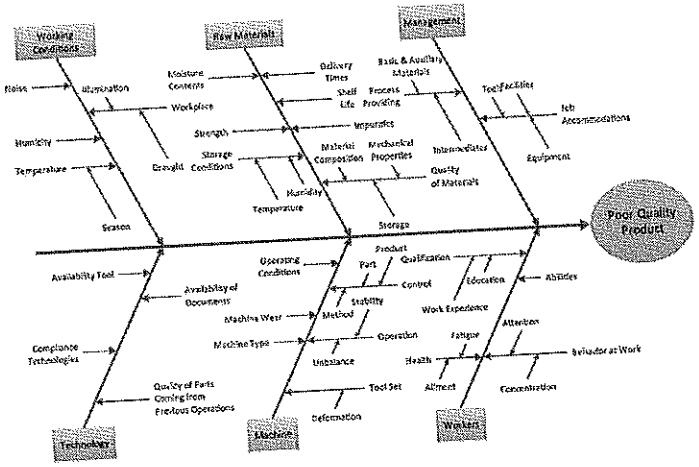
Section – C 04X06 = 24 Marks

Q.1. Draw Ishikawa diagram and mention its utility.

Ans.

Dr. Kaoru Ishikawa, a Japanese quality control statistician, invented the Ishikawa diagram also known as fishbone diagram. The design of the diagram looks much like the skeleton of a fish. Therefore, it is often referred to as the fishbone diagram. It is also called as cause-and-effect analysis. A cause-and-effect analysis generates and sorts hypotheses about possible causes of problems within a process by asking participants to list all of the possible causes and effects for the identified problem. Cause-and-effect diagrams can reflect either causes that block the way to the desired state or helpful factors needed to reach the desired state.

Fishbone Diagram - Causes of Low-Quality Output



Q.2. What is the highest failure rate for a product if it is having probability of survival of 95% at 4000 hours? Assume that the time to failure follows an exponential distribution.

Ans.

Solution **The reliability at 4000 hours is 0.95. if the constant failure rate is given by λ, we have**

$$R(t) = e^{-\lambda t} \quad or \quad 0.95 = e^{-\lambda(4000)}$$

This yields

$$\lambda = 0.0000128/\text{hour} = 12.8/10^6 \text{ hours}$$

Thus, the highest failure rate is $12.8/10^6$ hours for a reliability of 0.95 at 4000 hours.

Q.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%	

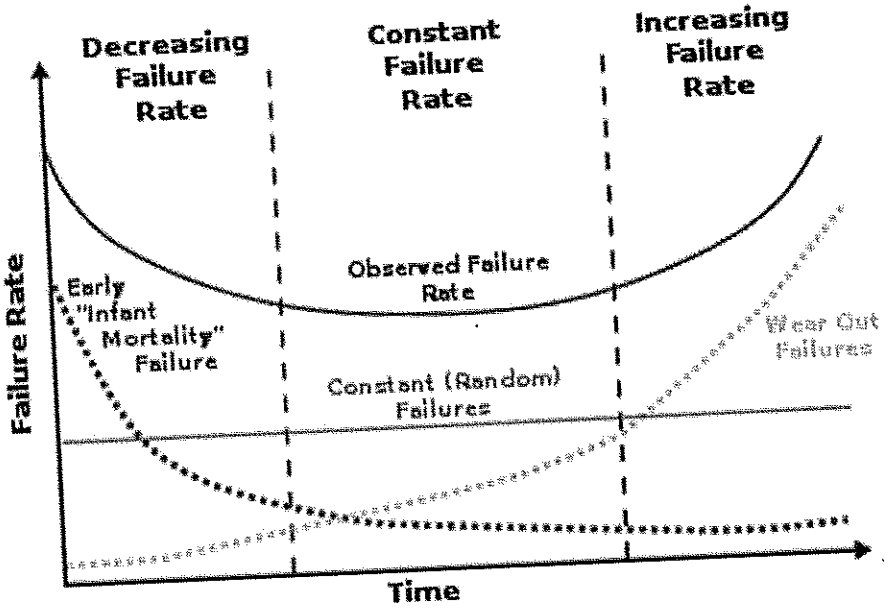
Cathegory	Items	Percentage of items	Percentage usage (%)	Action
Class A	107, 101	20%	81,6%	Close control
Class B	109, 105, 102, 106	40%	16,2%	Regular review
Class C	104, 110, 103, 108	40%	2,5%	Infrequent review

Q.4. Draw Bath tub curve and explain all the terminologies associated with it.

Ans.

The curve has three distinct zones. These zones differ from each other in frequency of failure and also causes of failure.

1. Infant mortality period
   It is the time comprising of initial life of the product when early failures occur due to defects in manufacturing, heat treatment, raw material etc. such deficiencies can be detected by debugging, extended testing.
2. Useful life
   After a company works on causes of premature failure, the failure rate comes down considerably. In this period the failure rate is nearly constant. The failure in this period mostly occurs due to chance causes.
3. End of life
   The failure in this period occurs due to corrosion, vibrations, fatigue, creep or abrasion etc. It is suggested that preventive maintenance or replacement of the dying parts should be carried out in this period to prevent any catastrophic failure of system.



Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

5th Semester, End-Sem. Examination

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

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 question from section B, each question carries four mark.
3. Answer all question from section C, each question carries six mark.

Section – A

10X01 = 10 Marks

Q-1. Painter A says, mixing room must have flash proof lights.
Painter B Says, flash proof light is not mandatory for paint mixing room.
Who is correct?

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

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

a. One
b. Two
c. Three
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
b. Painter B
c. Both (a) and (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
b. Due to improper Flash-off time
c. Due to the moisture in compressed air
d. All of the above

Q-5. Which type of disc is required for polishing?

a. P-500
b. P-1500
c. P-2000
d. Both (b) and (c)

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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. Pot 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

Q-9. Orange peel defect generally occurs during which 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 are the differences between High strength (H.S.) tinter and Low strength(L.S.) tinter?

Q-12. Write the SOP for color matching.

Q-13. Write the factors which effect the transfer efficiency of a spray gun

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

Section – C

04X06 = 24 Marks

Q-15. Explain the various masking methods.

Q-16. Discuss any two environmental defect and paint application defects each with its causes and remedies.

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

Q-18. Write the SOP to make a design on a panel.

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of Automotive Skills

5th Semester, End-Sem. Examination

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

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 question from section B, each question carries four mark.
3. Answer all question from section C, each question carries six mark.

Section – A

10X01 = 10 Marks

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b. Painter B
d. None of these

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c. Three
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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 is the difference between H.S tinter and L.S. tinter?

Ans:- The H.S. Stands for high strength and the pigmentation of the H.S. is very high and we generally used these tinters in the solid paints.

The L.S. Stands for Low strength tinters and the pifmentation of L.S. is very low and generally used for metallic and pearl paints.

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 factors which effect the transfer efficiency of a 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-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 the various masking methods.

Ans:- **.1. Masking for Surface Application**:-

- During surfacer application, we uses generally lower air pressure if compared with top coat.
- The reverse masking method is generally used to prevent the creation of spray step.

Reverse Masking:-

- It is a method in which the masking paper is applied with its inside out , so that only a thin coat of mist adheres along the border.
- It is used to reduce the creation of spray step while working with small areas like spot repainting.

2. Masking for Block Repainting:-

- For Block repainting, Panels such as fender or door must be masked individually.
- In case the panel has openings (like gap between panels etc.) they must be masked to prevent the paint mist from entering those areas.

3. Masking for spot repainting:-

a. For Repainting a quarter panel:-

- When repainting a panel without borders we need to ensure that there should not be any spray step.
- We use reverse masking in such cases to avoid spray step.

b. For Repainting the end of a fender:-

- To repaint the tip of a fender, the area must be repainted by spot repainting.
- Since the smaller area is repainted than block repainting, mask only the end part of fender suffices.

Q-16. Discuss any two environmental defect and paint application defects each with its prevention 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.**Color fade**

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. **Bird droppings**

Causes:-

- Due to shit of birds
- .
- 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

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. Write the Steps to make a design on a panel.

Ans.

1. Clean the panel.
2. Scuff the panel
3. Primer application
4. Sanding of primer
5. Sketch the design on the panel with the help of pencil.

6. Mask the design with the help of fine line masking tape.
7. Before basecoat check the masking properly.
8. Apply basecoat.
9. Remove the masking carefully after proper drying.
10. Mask the painted design properly with the help of masking tapes and papers.
11 Apply different basecoat on the panel.
12. After proper drying of basecoat remove the masking.
13. Check the edges and sand carefully with P-500 carefully.
14. Apply the clear coat on the panel.