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ANSWER BANK

ELEMENT ONE

Demonstrate knowledge of motor vehicle safety systems.

1. Explain the purpose of each of the following vehicle safety systems.

Ride stability control

Dynamic Stability Control is an electronic system designed to detect and automatically compensate for loss of control under extreme conditions, using brakes and throttle to help keep the vehicle under control.

Blind spot safety

As blind spots continue to be a hazard for drivers some vehicle manufacturers are now fitting cameras in each of the door mirrors to constantly monitor vehicles that are alongside. A warning light illuminates on the dash panel to warn the driver of a nearby vehicle.

Park assist

Sensors produce an audible warning to help the driver judge the distances between vehicles or obstacles when parking. The closer the vehicle gets to a collision the louder and more frequent the warning.

Collapsible steering column

Steering wheels have the potential to be a major cause of crush injuries to drivers during accidents. For this reason, collapsible columns have been introduced that collapse when heavy pressure is applied to the steering wheel.

Electronic brake force distribution

Electronic brake force distribution takes the place of the mechanically operated brake proportioning valve. The amount of braking pressure required by the rear wheels is varied depending on vehicle loading, speed and severity of braking. EBD is used in conjunction with ABS.

Driver alert system

A series of systems within the vehicle are used to detect driver drowsiness and respond by issuing an audible warning to the driver.

2. **Name the current Land Transport Rules that apply to each of the following motor vehicle safety systems:**

Glazing:

Glazing, Windscreen Wipe and Wash, and Mirrors 1999

Brakes:

Light Vehicle Brakes 2002

Seat anchorages:

Seats and Seat Anchorages 2002

Doors:

Door Retention Systems 2001

3. **What is the main purpose of an ACU?**

The ACU (Airbag Control Unit) is the very brain of the airbag system. The unit decides if and how to deploy the airbags. When the ACU detects that the deployment threshold has been reached, it initiates the inflation stage.

4. **Describe how a pre-tensioner responds in the event of a crash.**

When the crash sensors signal a collision the ECU sends an electric current to the igniter material which explodes and ignites the gas in the chamber generating a great amount of pressure. This pressure exits the chamber port and pushes on a piston which is connected to the seat belt cable inside a cylinder. The piston is suddenly forced away which shortens the seat belt stalk and tightens the seatbelt against the occupant. This actions holds the driver and passenger in position during the collision.

5. Describe the main safety feature of each of the following:

Laminated windscreen

Laminated glass will protect the vehicles occupants by not shattering on impact and containing the occupants in cases of frontal collision or roll-over

Door intrusion bar

Side door intrusion beams are now common place in motor vehicle unibody design and are fitted to protect the occupants in side impact accidents

Occupant protection cell

Modern vehicle chassis are typically unibody and are designed to crumple and bend in specific ways, which allows the kinetic energy of a crash to travel through the car's body, around the passenger cell. The areas around the passenger cell are controlled by crumple zones while the passenger compartment is reinforced.

6. How are vehicle safety systems typically tested?

Testing is usually carried out with a diagnostic tool that can read fault codes from the main vehicle computer. Some vehicles may also have a warning lamp that when flashing will relate to manufacturers information, some may even require the ECU to be re-programmed.

Tools commonly used are a scan tool, digital volt ohmmeter, or special testing equipment supplied by the manufacturer. Different manufacturers will use different methods of diagnosing safety system problems.

7. List three possible consequences of misdiagnosing faults in motor vehicle safety systems.

Vehicle failure
Accidents causing injury or damage
Workshop may be prosecuted
Technician may be prosecuted
Workshop will have to cover the costs of repairing damage
Damage to workshop reputation
Possible loss of W.O.F. authorisation

8. List the precautions that must be observed when storing air bags and pre-tensioners.

Carry horn bar and air bag inflator assembly with cover pointed away.

Never carry inflator assembly by its wires.

Never place steering column on floor with wheel to floor.

Always place horn bar and air bag inflator assembly with cover facing up.

Store in a cool, dry, dust free, area with the temperature below 70°C.

Always wear gloves and safety glasses when handling a deployed air bag.

ELEMENT TWO

Demonstrate knowledge of working on motor vehicle safety systems

- 1. When working on a vehicle that has been involved in a crash outline a precaution to take to ensure each of the following**

- a. Your personal safety**

Personal safety equipment i.e. safety boots, glasses, hearing protection etc.

- b. Safety of other people**

Communicate with fellow workers i.e. signage, verbally etc.

- c. Vehicle and equipment safety**

Adhere to all safety signage i.e. speed limits, safe parking, use recommended procedures and tools, store equipment after use.

- d. Workshop safety**

Follow recommended safety procedures, report all hazards

- e. Environmental safety**

Dispose of all waste in environmentally friendly ways, read all labels, store all hazardous chemicals safely (dangerous goods store)

- 2. Name the Land Transport Rule that applies to seatbelts.**

Seatbelts and Seatbelt Anchorages 2002

- 3. Explain how seatbelt webbing behaves during a crash.**

The forces generated during the collision are absorbed by the stretching of the seatbelt webbing with the support of the retractor mechanism.

4. List 6 seatbelt webbing conditions that if present would require a new seatbelt to be fitted.

Cuts, burn marks or signs of fraying

Broken or pulled threads

Cut loops at the belt edge

Colour fading as a result of exposure or incorrect chemical cleaning agents

Bowed webbing

Check the rib stitching, the part of the belt that is folded back and stitched.

This stitching is designed to partially tear at set loads, to provide control of the belt and to reduce shock movement.

Check the webbing buckle, twisting of the belt and D-ring mount and retractor.

5. After a crash outline the checks that should be carried out on each of the following:

Inertia reel system

Quickly pull the belt out of the reel to check that it locks first time. Ensure smooth quiet action of the inertia reel as the belt releases and retracts. If this does not occur the belt reel may need to be replaced.

Check the seat buckle mechanism to ensure that it clicks in when locked. Check the operation and security of the release button. If the button is damaged or does not release the buckle easily when pressed the mechanism will need to be replaced.

Seat anchorages

Check for any damage to the seat anchoring points. Check that the mounting bolts are tight and free of any cracks or distortion. Check that anchor for any damage or evidence of rust.

Seat belt assembly

Check for torn webbing, bent retractor or guide.

Check the seat belt mounting point for damage. Inspect the seat belt mount area for damage or distortion and repair as necessary before installing a new seat belt assembly.

Anchor bolts, washer or spacer are deformed.

Check the seat belt buckle mechanism

6. When removing a child safety restraint what should the anchoring points be checked for?

Check anchorage points for cracks in the metal.

Consult the vehicle owner's handbook for location of anchor fittings or anchorage points and the possible use of spacers. Some vehicles may have an anchor point fitted by the vehicle manufacturer. If anchorage points cannot be found refer to the car manufacturer, local child restraint fitting station or traffic authority for optimum position of anchorage point and the use of spacers.

7. After a crash outline the checks that should be carried out on air brake system.

A vehicle that has been involved in an accident must be checked properly by raising it on a hoist and inspecting the brake pipes and hoses for visible damage including crushing, bends, cuts, cracks, and fluid leaks.

Check for damage to callipers, backing plates, drum assemblies, park brake cables fittings and connections.

Ensure the ABS diagnostic system has been checked for trouble codes and no problem is evident.

8. After a crash outline the checks that should be carried out on the steering system.

Visually inspect all power steering hoses and lines for any traces of leaks. Any suspect hose or line should be replaced immediately. Check the security of all connections, and hoses and line attachments.

Check the steering assembly mountings and all steering linkage connections for security and evidence of distortion.

Raise the vehicle and check the steering for evidence of bent linkages and leaking power steering hoses.

Grasp the front wheels at 9 o'clock and 3 o'clock and turn the wheel from lock to lock. A damaged steering rack will have tight spots or an uneven feel.

Collapsible columns should be measured following a collision. This measurement should be compared with dimensions found in the vehicles service manual.

Check that the joints and steering-wheel are not bent or damaged.

9. List 6 wheel rim conditions that if present would require a new wheel to be fitted.

Inner or outer rim flanges are buckled
Cracks in the welds of the rim
Cracks in the wheel rim centres
Cracks in the wheel nut seats
Oval wheel nut seats
Different size and make wheel rims fitted to the vehicle
Mud and dirt build up on the wheel rim

10. Seats are often damaged during crashes. List 4 common types of damage that may occur.

Gears broken in adjustment mechanism
Cracked Seat frame
Bent seat frame
Bolting come loose in mechanism