

## Assessment Requirements

### Unit LV08K – Knowledge in Diagnosis and Rectification of Light Vehicle Chassis Faults

#### Content:

#### Electrical and electronic principles of light vehicle chassis systems

- a. The operation of electrical and electronic systems and components related to light vehicle chassis systems including:
  - i. ECU
  - ii. sensors and actuators
  - iii. electrical inputs
  - iv. voltages
  - v. oscilloscope patterns
  - vi. digital and fibre optic principles
- b. The interaction between the electrical/electronic system and mechanical components of chassis systems.
- c. Electronic and electrical safety procedures.

#### Operation of electronic ABS and EBD braking systems

- a. Layout of:
  - i. ABS and EBD braking systems
  - ii. anti-lock braking
  - iii. anti-skid control systems
  - iv. warning systems
- b. Operation of:
  - i. hydraulic and electronic control units
  - ii. wheel speed sensors
  - iii. load sensors
  - iii. hoses
  - iv. cables and connectors
- c. Advantage of ABS and EBD braking systems over conventional braking systems.
- d. The relationship and interaction of ABS braking with and other vehicle systems – traction control.

#### Steering geometry for light vehicle applications

- a. Non-steered wheel geometry settings.
- b. Front/rear wheel geometry:
  - i. castor
  - ii. camber
  - iii. kingpin or swivel pin inclination
  - iv. negative offset
  - v. wheel alignment (tracking)
  - vi. toe in and toe out
  - vii. toe out on turns and steered wheel geometry
  - viii. Ackerman principle
  - ix. slip angles
  - x. self-aligning torque
  - xi. oversteer and understeer
  - xii. neutral steer
- c. The operation and layout of rear and four wheel steering.
- d. The construction and operation of power assisted steering systems:
  - i. hydraulic system

- ii. power cylinders
- iii. drive belts and pumps
- iv. hydraulic valve (rotary, spool and flapper type)
- e. The operation of:
  - i. electronic power steering systems (EPS)
  - ii. electrical and electronic components

**Components and operation of self-levelling suspension**

- a. The components, construction and operation of a self levelling suspension system.
- b. The operation of self -levelling suspension system under various conditions:
  - i. self-energising
  - ii. pump operated self-levelling suspension

**Operation of fitting ride-controlled systems.**

- a. The reasons for fitting ride controlled systems.
- b. The operation of driver controlled and ride controlled systems.

**Symptoms and faults in braking systems**

- a. Symptoms and faults associated with conventional braking systems, ABS, and EBD systems:
  - i. mechanical
  - ii. hydraulic
  - iii. electrical and electronic systems
  - iv. fluid leaks
  - v. warning light operation
  - vi. poor brake efficiency
  - vii. wheel locking under braking

**Diagnosis and faults in braking systems**

- a. Locate and interpret information for:
  - i. diagnostic tests
  - ii. vehicle and equipment specifications
  - iii. use of equipment
  - iv. testing procedures
  - v. test plans
  - vi. fault codes
  - vii. legal requirements
- b. Prepare equipment for use in diagnostic testing.
- c. Conduct systematic testing and inspection of:
  - i. braking system
  - ii. ABS
  - iii. EBD
  - iv. mechanical
  - v. hydraulic
  - vi. electrical and electronic systems
- d. Using appropriate tools and equipment including:
  - i. multi-meters
  - ii. oscilloscope
  - iii. pressure gauges
- e. Evaluate and interpret test results from diagnostic testing.
- f. Compare test result and values with vehicle manufacturer's specifications and settings.
- g. How to dismantle, components and systems using appropriate equipment and procedures.
- h. Assess, examine and evaluate the operation, settings, values, condition and performance of components and systems.
- i. Probable faults, malfunctions, incorrect settings.
- j. Rectification or replacement procedures.

- k. Operation of systems following diagnosis and repair to confirm operation and performance.

**Symptoms and faults associated with steering systems**

- a. Symptoms and faults associated with steering systems:
  - i. mechanical
  - ii. hydraulic
  - iii. electrical and electronic
  - iv. steering boxes (rack and pinion, worm and re-circulating ball)
  - v. steering arms and linkages
  - vi. steering joints and bushes
  - vii. idler gears
  - viii. bearings
  - ix. steering columns (collapsible and absorbing)
  - x. power steering system

**Diagnosis and faults in steering systems**

- a. Locate and interpret information for:
  - i. diagnostic tests
  - ii. vehicle and equipment specifications
  - iii. use of equipment
  - iv. testing procedures
  - v. test plans
  - vi. fault codes
  - vii. legal requirements
- b. How to prepare equipment for use in diagnostic testing.
- c. Conduct systematic testing and inspection of:
  - i. steering systems
  - ii. mechanical
  - iii. hydraulic
  - iv. electrical and electronic systems
  - v. power steering system
- d. Using appropriate tools and equipment including:
  - i. multi-meters
  - ii. oscilloscope
  - iii. pressure gauges
  - iv. wheel alignment equipment
  - v. steering geometry equipment
- e. Evaluate and interpret test results from diagnostic testing.
- f. Compare test result and values with vehicle manufacturer's specifications and settings.
- g. How to dismantle, components and systems using appropriate equipment and procedures.
- h. Assess, examine and evaluate the:
  - i. operation
  - ii. settings
  - iii. values
  - iv. condition and performance of components and systems
- i. Probable faults, malfunctions, and incorrect settings.
- j. Rectification or replacement procedures.
- k. Operation of systems following diagnosis and repair to confirm operation and performance.

**Symptoms and faults associated with suspension systems**

- a. Symptoms and faults associated with suspension systems:
  - i. mechanical
  - ii. hydraulic
  - iii. electrical and electronic
  - iv. conventional

- v. self-levelling and ride controlled suspension systems
- vi. ride height (unequal and low)
- vii. wear
- viii. noises under operation
- ix. fluid leakage
- x. excessive travel
- xi. excessive tyre wear

### **Diagnosis and faults in suspension systems**

- a. Locate and interpret information for:
  - i. diagnostic tests
  - ii. vehicle and equipment specifications
  - iii. use of equipment
  - iv. testing procedures
  - v. test plans
  - vi. fault codes
  - vii. legal requirements
- b. How to prepare equipment for use in diagnostic testing.
- c. How to conduct systematic testing and inspection of:
  - i. suspension systems
  - ii. mechanical
  - iii. hydraulic
  - iv. electrical and electronic systems
  - v. conventional
  - vi. self-levelling and ride controlled suspension systems
- d. Using appropriate tools and equipment including:
  - i. multi-meters
  - ii. oscilloscope
  - iii. pressure gauges
  - iv. alignment equipment
  - v. geometry equipment
- d. Evaluate and interpret test results from diagnostic testing.
- e. Compare test result and values with vehicle manufacturer's specifications and settings.
- f. How to dismantle, components and systems using appropriate equipment and procedures.
- g. Assess, examine and evaluate the operation, settings, values, condition and performance of components and systems.
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Measurements on components to include:

- a. settings
- b. input and output values
- c. voltages
- d. current consumption
- e. resistance
- f. output patterns with oscilloscope
- g. pressures
- h. condition
- i. wear and performance