

Assessment Requirements

Unit HV08K – Knowledge of Diagnosis and Rectification of Heavy Vehicle Chassis Faults

Content:

Chassis system operation:

- a. Construction and operation of heavy vehicle chassis systems to include:
 - i. Anti-lock Braking Systems (ABS)
 - ii. Electronic Braking Systems (EBS)
 - iii. Electronic Brake-force Distribution (EBD)
 - iv. Anti-Slip Regulation / Traction Control (ASR)
 - v. Electronic Stability Programme (ESP)
 - vi. Rear wheel steer
 - vii. power assisted steering
 - viii. Electronically Controlled Air Suspension (ECAS)

- b. The Engineering principle relating to heavy vehicle chassis systems:
 - i. inertia force, mass and acceleration
 - ii. laws of friction
 - iii. statics (springs and torsion bars)
 - iv. hydraulic and pneumatic principles

- c. Make suitable adjustments to components including:
 - i. settings
 - ii. input and output values
 - iii. voltages
 - iv. current consumption
 - v. resistance
 - vi. output patterns with oscilloscope
 - vii. pressures
 - viii. condition
 - ix. wear and performance

Electrical and electronic principles of heavy vehicle chassis systems

- a. The operation of electrical and electronic systems and components related to heavy vehicle chassis systems including:
 - v. ECU
 - vi. sensors and actuators
 - vii. electrical inputs
 - viii. voltages
 - ix. oscilloscope patterns
 - x. 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, EBS, ASR and EBD braking systems

- a. Layout of:
 - i. ABS, EBS, ASR and EBD braking systems
 - ii. anti-lock braking

- iii. anti-spin regulation systems
- iv. warning systems
- b. Operation of:
 - i. pneumatic, hydraulic and electronic control units
 - ii. wheel speed sensors
 - iii. load sensors
 - iv. hoses
 - v. cables and connectors
- c. Advantage of ABS and EBS braking systems over conventional braking systems.
- d. The relationship and interaction of electronic braking control with other vehicle systems

Steering geometry for heavy 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 out on turns and steered wheel geometry
 - vii. Ackerman principle
 - viii. slip angles
 - ix. self-aligning torque
 - x. oversteer and understeer
 - xi. neutral steer
- c. The operation and layout of rear wheel steering and self-steered axles.
- 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)

Components and operation of electronically controlled air suspension

- a. The components, construction and operation of an electronically controlled air suspension system.
- b. The operation of electronically controlled air suspension systems under various conditions:
 - i. laden
 - ii. unladen
 - iii. cornering
- c. The relationship and interaction of electronically controlled air suspension with other vehicle systems

Symptoms and faults in braking systems

- a. Symptoms and faults associated with conventional braking systems, ABS, EBS and EBD systems:
 - i. mechanical
 - ii. hydraulic
 - iii. electrical and electronic systems
 - iv. fluid and air leaks
 - v. poor brake efficiency
 - vi. 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. pneumatic
 - 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
 - v. steering arms and linkages
 - vi. steering joints and bushes
 - vii. idler gears
 - viii. bearings
 - ix. steering columns (collapsible and absorbing)
 - x. power assisted 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 assisted 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. pneumatic
 - iii. electrical and electronic
 - iv. self-levelling and ride controlled suspension systems
 - v. ride height (unequal and low)
 - vi. wear
 - vii. noises under operation
 - viii. fluid or air leakage
 - ix. excessive travel
 - x. 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. 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.
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- g. Assess, examine and evaluate the operation, settings, values, condition and performance of components and systems.
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