

## Assessment Requirements

### Unit LV13K – Knowledge of Diagnosis and Rectification of Light Vehicle Transmission and Driveline Faults

#### Content:

#### **Electrical and electronic principles related to light vehicle transmission systems**

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

#### **The operation light vehicle clutches and fluid couplings**

- a. The construction and operation of friction clutches (coil spring, diaphragm) including single and twin clutch designs.
- b. The construction and operation of fluid couplings including:
  - i. fluid flywheel
  - ii. torque converter (torque multiplication, efficiency)
  - iii. benefits of fluid couplings
  - iv. benefits of torque converter over fluid flywheel

#### **The operation of light vehicle transmissions and driveline systems**

- a. The construction and operation of manual gearboxes:
  - i. 4, 5 & 6 speed gearboxes
  - ii. gear arrangements
  - iii. shaft and bearing arrangements
  - iv. synchromesh devices
  - v. interlock mechanisms
  - vi. linkages
  - vii. overdrive
  - viii. lubrication
- b. The construction and operation of automatic gearboxes including hydraulic and electronic control systems: operations of epicyclic gears (sun, planet, annulus and carrier), method for achieving different gear ratios using epicyclic gearing; hydraulic control systems, components and operation; electronic control system, components and operation.
- c. The construction and operation of continuously variable transmissions (CVT) and the benefits of this type of gearbox design.
- d. The construction and operation of the sequential manual gearbox (SMG).
- e. The construction and operation of final drive systems including:
  - i. conventional crown wheel and pinion
  - ii. differential gears
  - iii. limited slip differential
- f. The construction and operation of light vehicle 4 wheel drive systems including third differential and differential locks.
- g. The operation of light vehicle traction control systems and launch control.

- h. The construction and operation of light vehicle hub arrangements.
- i. The construction and operation of:
  - i. drive shafts
  - ii. prop shafts including flexible joints and couplings
  - iii. universal joints
  - iv. constant velocity joints
  - v. sliding joints

### **Symptoms and faults in light vehicle transmissions and drive-line systems**

- a. Clutch and coupling faults:
  - i. abnormal noises
  - ii. vibrations
  - iii. fluid leaks
  - iv. slip
  - v. judder
  - vi. grab
  - vii. failure to release
- b. Gearbox faults:
  - i. abnormal noises
  - ii. vibrations
  - iii. loss of drive
  - iv. difficulty engaging or disengaging gears
  - v. automatic gear box types
  - vi. abnormal noises
  - vii. vibrations
  - viii. loss of drive
  - ix. failure to engage gear
  - x. failure to disengage gear
  - xi. leaks
  - xii. failure to operate
  - xiii. incorrect shift patterns
  - xiv. electrical and electronic faults
- c. Final drive faults:
  - i. abnormal noises
  - ii. vibrations
  - iii. loss of drive
  - iv. oil leaks
  - v. failure to operate
  - vi. electrical and electronic faults
- d. Drive-lines and couplings:
  - i. abnormal noises
  - ii. vibrations
  - iii. loss of drive

### **Faults in light vehicle transmission systems**

- a. Interpret information for diagnostic tests, vehicle and equipment specifications, use of equipment, testing procedures, test plans, fault codes and legal requirements.
- b. How to prepare equipment for use in diagnostic testing.
- c. How to conduct systematic testing and inspection of transmission system, mechanical, hydraulic, electrical and electronic systems using appropriate tools and equipment including, mullet-meters, oscilloscope and pressure gauges.
- d. How to carry out workshop based and road testing of vehicle and transmission system.
- e. Evaluate and interpret test results from diagnostic and/or road 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 and incorrect settings.
- j. Rectification or replacement procedures.
- k. Operation of systems following diagnosis and repair to confirm operation and performance.  
Measurements on components to include:
  - 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