

## Assessment Requirements

### Unit LV02.1K – Knowledge of Light Vehicle Engine Mechanical, Lubrication and Cooling System Units and Components

#### Content:

#### Engines

- a. Engine types and configurations:
  - i. inline
  - ii. flat
  - iii. vee
  - iv. four-stroke cycle and two-stroke cycle for spark ignition and compression ignition engines
  - v. naturally aspirated and turbo-charged engines
  - vi. hybrid fuel engines
- b. Relative advantages and disadvantages of different engine types and configurations.
- c. Engine components and layouts:
  - i. single (OHC) and multi camshaft (DOHC)
  - ii. single and multi cylinder (2, 4, 6, 8 cylinder types)
- d. Cylinder head layout and design, combustion chamber and piston design.
- e. Calculate compression ratios from given data.
- f. The procedures used when inspecting engines
- g. The procedures to assess:
  - i. serviceability
  - ii. wear
  - iii. condition
  - iv. clearances
  - v. settings
  - vi. linkages
  - vii. joints
  - viii. fluid systems
  - ix. adjustments
  - x. operation and functionality
  - xi. security
- h. Symptoms and faults associated with mechanical engine operation:
  - i. poor performance
  - ii. abnormal or excessive mechanical noise
  - iii. erratic running
  - iv. low power
  - v. exhaust emissions
  - vi. abnormal exhaust smoke
  - vii. unable to start
  - viii. exhaust gas leaks to cooling system
  - ix. exhaust gas leaks

#### Lubrication

- a. The advantages and disadvantages of wet and dry systems.
- b. Engine lubrication system:
  - i. splash and pressurised systems
  - ii. pumps
  - iii. pressure relief valve
  - iv. filters
  - v. oil ways

- vi. oil coolers
- c. Terms associated with lubrication and engine oil:
  - i. full-flow
  - ii. hydrodynamic
  - iii. boundary
  - iv. viscosity
  - v. multi-grade
  - vi. natural and synthetic oil
  - vii. viscosity index
  - viii. multi-grade
- d. The requirements and features of engine oil:
  - i. operating temperatures
  - ii. pressures
  - iii. lubricant grades
  - iv. viscosity
  - v. multi-grade oil
  - vi. additives
  - vii. detergents
  - viii. dispersants
  - ix. anti-oxidants inhibitors
  - x. anti-foaming agents
  - xi. anti-wear
  - xii. synthetic oils
  - xiii. organic oils
  - xiv. mineral oils
- e. Symptoms and faults associated with lubrication systems:
  - i. excessive oil consumption
  - ii. oil leaks
  - iii. oil in water
  - iv. low or excessive pressure
  - v. oil contamination
- f. The procedures used when inspecting lubrication system

### **Cooling, Heating and Ventilation**

- a. The components, operating principles, and functions of engine cooling systems
- b. Procedures used to remove, replace and adjust cooling system components
  - i. cooling fans and control devices
  - ii. header tanks, radiators and pressure caps
  - iii. heater matrix's and temperature control systems
  - iv. expansion tanks hoses, clips and pipes
  - v. thermostats impellers and coolant
  - vi. ventilation systems
- c. The preparation and method of use of appropriate specialist equipment used to evaluate system performance following component replacement
  - i. system pressure testers
  - ii. pressure cap testers
  - iii. hydrometer, or anti-freeze testing equipment
  - iv. chemical tests for the detection of combustion gas
- d. The layout and construction of internal heater systems.
- e. The controls and connections within internal heater system.
- f. Symptoms and faults associated with cooling systems:
  - i. water leaks
  - ii. water in oil
  - iii. internal heating system: efficiency, operation, leaks, controls, air filtration, air leaks and contamination

- iv. excessively low or high coolant temperature
- g. The procedures used when inspecting
  - i. internal heating system
  - ii. cooling system

**General**

- a. The preparation, testing and use of tools and equipment used for:
  - i. dismantling
  - ii. removal and replacement of engine units and components
- b. Appropriate safety precautions:
  - i. PPE
  - ii. vehicle protection when dismantling
  - iii. removal and replacing engine units and components
- c. The importance of logical and systematic processes.
- d. The inspection and testing of engine units and components.
- e. The preparation of replacement units for re-fitting or replacement.
- f. The reasons why replacement components and units must meet the original specifications (OES) – warranty requirements, to maintain performance and safety requirements.
- g. Refitting procedures.
- h. The inspection and testing of units and system to ensure compliance with manufacturer's, legal and performance requirements.
- i. The inspection and re-instatement of the vehicle following repair to ensure customer satisfaction;
  - i. cleanliness of vehicle interior and exterior
  - ii. security of components and fittings
  - iii. re-instatement of components and fittings