

## Assessment Requirements

### Unit MC02.1K – Knowledge of Motorcycle Internal Engine Systems

#### Content:

#### Engines

- a. Engine types and configurations:
  - i. inline
  - ii. flat
  - iii. vee
  - iv. four-stroke and two-stroke cycle for spark ignition engines
  - v. naturally aspirated and turbo-charged 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, 3, 4, 6 cylinder types)
  - iii. port design: inlet, transfer and exhaust
- d. Cylinder head layout and design, combustion chamber and piston design.
- e. The procedures used when inspecting engines
- f. 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
- g. 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:
- h. 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,**

- 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. fins and cowlings
  - iii. header tanks, radiators and pressure caps
  - iv. expansion tanks hoses, clips and pipes
  - v. thermostats impellers and coolant
- 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. anti-freeze testing equipment
  - iv. chemical tests for the detection of combustion gas
- d. Symptoms and faults associated with cooling systems:
  - i. water leaks
  - ii. water in oil
  - iii. blocked fins
  - iv. excessively low or high coolant temperature
- e. The procedures used when inspecting
  - i. cooling systems

### **Clutch**

- a. The components, operating principles, and functions of clutch's
  - i. wet clutch
  - ii. dry clutch
  - iii. centrifugal
  - iv. cable control
  - v. hydraulic control
- b. Procedures used to remove, replace and adjust clutch systems and components
- c. The preparation and method of use of appropriate specialist equipment used to evaluate system performance following component replacement
- d. Symptoms and faults associated with clutch systems
  - i. slip
  - ii. drag

### **Transmission**

- a. The components, operating principles, and function of transmission systems
  - i. conventional gear
  - ii CVT
  - iii Automatic
- b. the operating components within transmission systems
  - i. gears
  - ii. shafts
  - iii. selectors
  - iv. shift lever and drum mechanisms
  - v. bearings
  - vi. pulleys
- c. The preparation and method of use of appropriate specialist equipment used to evaluate transmission system performance following component replacement
- d. Procedures used to remove, replace and adjust transmission systems and components
- e. Symptoms and faults associated with transmission systems
  - i. abnormal noises
  - ii. vibration
  - iii. fluid leaks
  - iv wear
  - v. gear selection

## General

The preparation, testing and use of tools and equipment used for:

- i. dismantling
- ii. removal and replacement of engine mechanical and power train system components

Appropriate safety precautions:

- i. PPE
- ii. motorcycle protection when dismantling
- iii. removal and replacing engine mechanical and power train units and components

The importance of logical and systematic processes.

The inspection and testing of engine mechanical and power train units and components.

The preparation of replacement units for re-fitting or replacement.

The reasons why replacement components and units must meet the original specifications (OES) – warranty requirements, to maintain performance and safety requirements.

Refitting procedures.

The inspection and testing of units and system to ensure compliance with manufacturer's, legal and performance requirements.

The inspection and re-instatement of the motorcycle following repair to ensure customer satisfaction;

- i. cleanliness of motorcycle
- ii. security of components and fittings
- iii. re-instatement of components and fittings

construction and operation of motorcycle engine mechanical systems

- a. four stroke
- b. two stroke

k. key engineering principles that are related to engine mechanical systems

- a. compression ratio's
- b. volumetric efficiency
- c. cylinder capacity

l. common terms used in motorcycle engine mechanical system design

- a. tdc
- b. bdc
- c. stroke
- d. bore
- e. ports

m. construction and operation of motorcycle engine lubrication components and systems

- a. full flow
- b. by pass
- c. wet sump
- d. dry sump
- e. total loss

n. key engineering principles that are related to motorcycle engine lubrication systems

- a. classification of lubricants
- b. properties of lubricants
- c. methods of reducing friction

o. common terms used in motorcycle engine lubrication system design

p. identify motorcycle engine cooling system components

- a. air cooling

- b. liquid cooling
- q. key engineering principles that are related to motorcycle engine cooling systems
  - a. heat transfer
  - b. linear and cubical expansion
  - c. specific heat capacity
  - d. boiling point of liquids
- r. construction and operation of motorcycle clutch and transmission system components
  - a. dry clutch
  - b. wet clutch
  - c. constant mesh
  - d. CVT
  - e. automatic
  - f. chain and sprocket
  - g. shaft and gear
  - h. belt and pulley