UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

COURSE NAME	:	ENGINE MAINTENANCE AND SERVICES
COURSE CODE	:	BNG 31903
PROGRAMME CODE	:	BNG
EXAMINATION DATE	:	JULY 2024
DURATION	:	3 HOURS
INSTRUCTIONS	:	1. ANSWER ALL QUESTIONS 2. THIS FINAL EXAMINATION IS CONDUCTED VIA ☐ Open book ☒ Closed book 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 Vehicle service information typically includes detailed instructions, guidelines, and specifications provided by the manufacturer to help ensure proper maintenance, repair, and operation of the vehicle.

(a) Explain the main functions of the owner's manual.

(2 marks)

(b) Compare the differences between the owner's manual and the vehicle service manual.

(4 marks)

(c) Vehicle identification refers to the process of uniquely identifying a specific vehicle. Identify **FOUR (4)** significant pieces of information included in the vehicle identification number (VIN).

(4 marks)

(d) In addition to identifying the vehicle, service information also encompasses the vehicle's base emission level. Define the meant by EURO level emission.

(4 marks)

(e) Distinguish the differences between EURO 2 and EURO 4 in terms of the emission level of gasoline vehicles.

(4 marks)

(f) Outline **TWO (2)** emission control systems that are available in the current modern vehicle.

(2 marks)

Q2 Compression ratio is one of the fundamental specifications of an internal combustion engine that determines engine performance and overall efficiency.

(a) Show the compression ratio using a diagram with the labels.

(6 marks)

(b) Give **TWO (2)** different ways to change the compression ratio.

(2 marks)

(c) A 4-cylinder 4-stroke gasoline port injection engine with a 83.5 mm bore running at a rated power of 120 kW at 6000 rpm.

(i) Calculate the engine displacement in cc if the stroke length is 91.2 mm.

(2 marks)

(ii) Calculate the compression ratio of the engines if the clearance volume of the cylinder is 41.625 cc.

(2 marks)

(iii) Calculate the engine maximum torque at 6000 rpm.

(2 marks)

(d) The engine cooling system enables the engine to run at its optimum temperature. The system sends a liquid coolant through the passage in the engine block and cylinder head.

(i) Construct a block diagram and label a complete engine cooling system of a passenger's vehicle.

(4 marks)

(ii) Explain the primary function of the thermostat.

(2 marks)

Q3 Engine oil is a lubricant used in internal combustion engines, such as power cars, motorcycles, lawnmowers, engine-generators, and others.

(a) Identify **FOUR (4)** critical functions of the engine's lubricating fluid.

(4 marks)

(b) Maintaining the proper engine oil level in a vehicle is essential to maximize engine protection. Label and illustrate the indication of the engine oil level on the dipstick.

(4 marks)

(c) Explain the meaning of the 15W-40 designation in multigrade engine oil.

(2 marks)

(d) Most vehicle manufacturers recommend changing the engine oil every 6 months or 10,000 km accumulated mileage, whichever comes first.

(i) Briefly explain the rationale behind this recommendation.

(2 marks)

(ii) Provide examples of potential consequences if this maintenance schedule is not followed

(4 marks)

(iii) Provide justification for fully synthetic engine oil (0W-20) is typically not recommended for use in older engines.

(4 marks)

Q4 Engine measurement, also known as engine blueprinting, is a meticulous process of precisely measuring and documenting critical dimensions, clearances, and specifications of various engine components to achieve optimal performance, reliability, and consistency.

(a) **Figure Q4.1** illustrates the measurement of the crucial components during an engine overhaul. Justify the importance of this measurement and state **TWO (2)** measuring tools that are commonly used in this process.

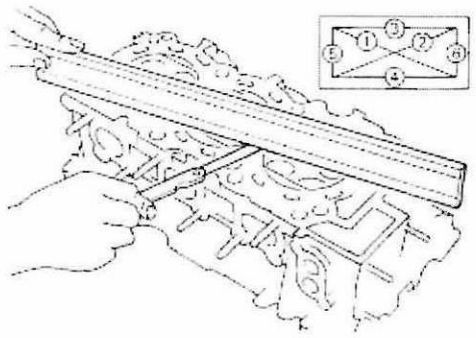

Figure Q4.1

(4 marks)

(b) Define the Coordinate Measuring Machine (CMM) and suggest **TWO (2)** examples of parts measurement that can be done with it.

(4 marks)

(c) Tappet clearance, also known as valve clearance, is the small gap between the rocker arm and the top of the valve stem. Discuss the significance of the tappet clearance in engine measurement activities.

(4 marks)

(d) Describe the procedure for measuring bearing clearance using plastigauge. Include the necessary steps and equipment required during the process.

(6 marks)

(e) Explain the important of valves, valve springs, and lifters are sorted in order during the disassembly of the cylinder head.

(2 marks)

Q5 Successful engine assembly depends on getting all of the details right. All the processes should be based on the instructions stated in the service manual provided by the car manufacturers. The engine will then be tested on an engine dynamometer after the engine is assembled permits checking for possible problems or leaks before the engine is installed in the vehicle.

(a) List **FOUR (4)** items that need to be installed as part of the short block assembly.

(4 marks)

(b) Identify the importance of engine pre lube before the engine is started.

(2 marks)

(c) Suggest **TWO (2)** important procedures to ensure all the cylinder head cover bolts are properly tightened during the installation process.

(4 marks)

(d) List **TWO (2)** types of dynamometers.

(2 marks)

(e) Classify the differences between measured values and calculated values resulting from testing an engine on a dynamometer.

(4 marks)

(f) An engine knocking noise is often difficult to diagnose. Identify **TWO (2)** possible reasons that cause engine knocking.

(4 marks)

- END OF QUESTIONS -