

The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Mechanical Engineering



Study Programme	: Bachelor of Science Honours in Engineering
Name of the Examination	: Final Examination
Course Code and Title	: DMX5209 Automotive Electronics
Academic Year	: 2024/2025
Date	: 5 th March 2026
Time	: 13.30-16.30
Duration	: 3 hours

General Instructions

1. Read all instructions carefully before answering the questions.
 2. This question paper consists of **Five (5)** questions in **Three (3)** pages.
 3. Answer for each question should commence from a new page.
 4. This is a Closed Book Test (CBT).
 5. Answers should be in clear handwriting.
 6. Answer to all questions.
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Question 01

- a) List three input signals and two output signals involved in an electronic engine control unit (ECU). [5]
- b) Briefly explain the operation of the Magnetic Reluctance wheel speed sensor with necessary diagrams. [5]
- c) Briefly explain the operation principle of the Throttle Position Sensor with necessary diagrams. [5]
- d) Briefly explain the operation of the hot wire mass air flow sensor with a necessary diagram. [5]

Question 02

- a) Explain the operating principle of an electronically controlled fuel injector using a necessary diagram. [5]
- b) Explain the voltage and current waveforms of a fuel injector with a neat diagram. Highlight the significance of peak current, hold current, and the injector closing time [5]
- c) Describe the working principle of a simplified electronic ignition circuit used in spark-ignition engines. [5]
- d) Explain the difference between a Saturated Injector Driver and Peak & Hold Injector Drivers. [5]

Question 03

- a) Identify the sensors and actuators used in the Anti-lock Braking System (ABS) and explain the operation of the sensors and actuators. [5]
- b) Sketch the block diagram of the Anti-lock Braking System and briefly explain the operation of the system. [5]
- c) Identify the sensors and actuators used in the Electronic Steering Control System. [5]
- d) Identify the sensors and actuators used in Idle speed control system and sketch the block diagram of the Idle speed control system. [5]

Question 04

- a) Explain the construction and working principle of a Brushless DC (BLDC) motor used in modern hybrid vehicles. [6]
- b) Sketch a basic driver circuit used to drive a Brushless DC (BLDC) motor. [4]
- c) Explain how a three-phase alternator generates a DC output through a full-wave rectifier configuration using a clear circuit diagram. [10]

Question 05

- a) Briefly explain the following Architectures of Hybrid Electric Drive Trains.
- i. Series (electrically coupling)
 - ii. Parallel (mechanical coupling)
- [8]
- b) Briefly explain the Traction Motor Characteristics with a characteristic curve. [5]
- c) Briefly describe the operation of a time-division multiplexing (TDM) system in a vehicle instrumentation computer, with the aid of a suitable block diagram. [7]

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