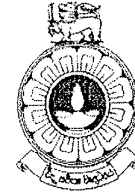


The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Mechanical Engineering



Study Programme	: Bachelor of Science Honours in Engineering
Name of the Examination	: Final Examination
Course Code and Title	: DMX5209 Automotive Electronics
Academic Year	: 2023/2024
Date	: 11 th March 2025
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 on **Three (3)** pages.
 5. The answer for each question should commence from a new page.
 6. This is a Closed Book Test (CBT).
 7. Answers should be in clear handwriting.
 8. Answer to all questions.
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Question 01

- a) Automotive temperature sensors are used to measure temperature at many places in an automobile. List different types of temperature sensors used in automotive electronic control systems.
- b) Briefly explain the operation principle of the **Throttle Position Sensor**.
- c) List three applications of **speed sensors** in automotive electronic control systems.
- d) Vehicle speed sensors can be divided into two categories, what are these categories? and help of diagrams briefly explain their operations.

Question 02

Air flow sensors measure either the volume or the mass of air flowing in a channel. In an automobile, the primary use of an airflow sensor is to determine the amount of air drawn into the engine through the intake manifold.

- a) List different types of mass air flow sensors.
- b)
 - 1) Explain the operation of the hot wire mass air flow sensor shown in Figure Q3.
 - 2) What are the advantages of using the Wheatstone bridge configuration in this sensor?

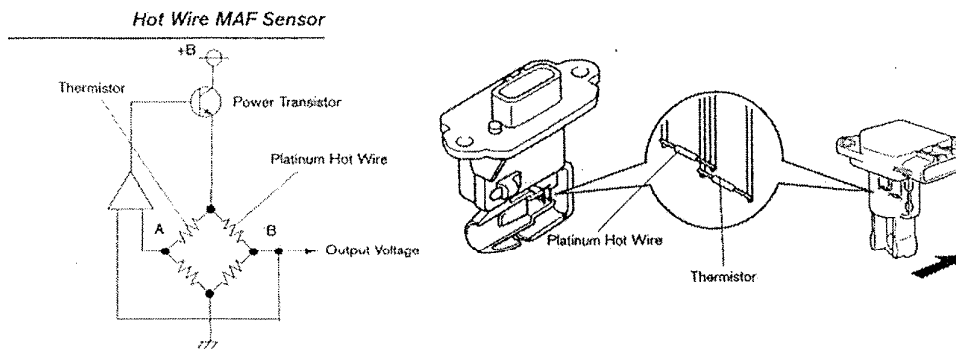


Figure Q3

- c) What is the type of output signal generated by the mass air flow sensor? What would be the expected output when vehicle speed increased?
- d) Explain the necessary steps you have to take when a mass air flow sensor is connected to a microcontroller.

Question 03

- a) Identify the sensors and actuators used in the **Anti-lock Braking System (ABS)**.
- b) Draw the block diagram of **Anti-lock Braking System** and briefly explain the operation of the system.
- c) What are the sensors and actuators used in **Electronic Fuel Injection (EFI)** system? and briefly explain them.
- d) Draw a block diagram of **EFI** system with necessary sensors and actuators.

Question 04

- a) What is brushless DC motor? Draw a diagram of a brushless DC motor.
- b) What are the advantages of brushless DC motor over brushed DC motor?
- c) What are the available types of stepper motors? And briefly explain each type.
- d) Briefly explain how stepper motors incorporate with electronic throttle control system. Sketch the block diagram of the electronic throttle control system with necessary sensors and actuators.

Question 05

- a) Briefly explain the concept of Hybrid Electric Drive Trains with a conceptual illustration.
- b) What are the available architectures of Hybrid Electric Drive Trains?
- c) Briefly explain Four-Quadrant Operation principle in class E four-quadrant chopper with necessary circuit diagrams.
- d) Briefly explain the operation principle of the vehicle Alternator with a circuit diagram.

END