Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023

COURSE NAME	:	AUTOMOTIVE ELECTRIC AND ELECTRONIC SYSTEM
COURSE CODE	:	BNG 20203
PROGRAMME CODE	:	BNG
EXAMINATION DATE	:	JULY/ AUGUST 2023
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	1. ANSWER **ALL** QUESTIONS. 2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSE 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 (a) A car 12V battery is a rechargeable energy storage device that provides electrical power to a vehicle's electrical system, including the starting system, ignition system, lighting, and various other electrical components. The battery's capacity is measured in ampere-hours (Ah) and its ability to deliver power is measured in cold cranking amperes (CCA)

(i) Describe the composition and operation of a typical 12V car battery.
(4 marks)

(ii) Explain the significance of the "cold cranking amps" (CCA) rating for a car battery.
(4 marks)

(iii) Calculate the charge current for a battery that has an ampere-hour rating is 35Ah.
(2 marks)

(b) Analyze in detail what is the purpose of alternator in a vehicle's electrical system
(6 marks)

(c) A relay is an electrical component that is used to switch electrical circuits on and off by controlling the flow of current between two or more electrical contacts. It works as an electrically operated switch, allowing a small electrical signal to control a larger electrical load. Draw and label the basic wiring diagram for a horn system requiring relay as the electrical switch.
(4 marks)

(d) The purpose of cruise control in a vehicle is to maintain a constant speed without the need for the driver to manually adjust the throttle pedal. With cruise control engaged, the vehicle will maintain a constant speed regardless of changes in road grade or wind resistance. Identify **FIVE (5)** sensors and components required in a cruise control system.
(5 marks)

Q2 (a) Thermistors and thermocouples are both types of temperature sensors, but they work in different ways and are used in different applications. Differentiate the measurement capabilities of a thermistor and a thermocouple.
(3 marks)

(b) **Figure Q2(b)** shows the inductive sensor principle and a typical device used as a crankshaft speed and position sensor in a vehicle.

(i) Identify **THREE (3)** inductive sensors that used in automobile engine.
(3 marks)

(ii) Labelled the stages of **A, B, C, D, E** in **Figure Q2(b)** according to vehicle measurement system.
(5 marks)

(iii) Illustrate the input signal pattern of the inductive-type sensor at point C and output at point E.

(4 marks)

(c) A knock sensor is a type of electronic device that must have in any internal combustion powered vehicles.

(i) Identify the main function of knock sensor.

(2 marks)

(ii) Figure out what will happen if knock sensor is malfunction.

(6 marks)

(iii) Determine the other sensors in an automobile vehicle that use the same accelerometer-type sensors as the knock sensor.

(2 marks)

Q3 (a) EMS known as Engine Management System. Define the main purpose of EMS in automotive application.

(3 marks)

(b) The ECU (Electronic Control Unit) in automotive refers to a computerized system responsible for managing and controlling various functions and components within a vehicle.With an aid of diagram, explain **THREE (3)** steps on how the ECU works from the driver until to the output components.

(8 marks)

(c) In automotive Engine Management Systems (EMS) application, there are two types of EMS which known as load-based EMS and torque-based EMS. By using a table, differentiate the primary function, advantages and disadvanges between load-based and torque-based EMS.

(6 marks)

(d) For full ignition control operation, the electronic control unit (ECU) has to determine the basic timing for three different conditions. Name and explain **TWO (2)** conditions.

(4 marks)

(e) The fuel supply in a modern automotive engine is closely related to the Electronic Control Unit (ECU), which is responsible for managing and controlling various aspects of the engine's operation. Fuel filter and Fuel rail are a part of main components in fuel supply system; list **TWO (2)** functions of each compoents during fuel delivery.

(4 marks)

Q4 (a) Explain in details characteristic of CAN message signal.

(4 marks)

(b) Automotive network system involved multiplexing processes to combine several messages for transmission over the same signal path. In vehicle networking multiplexing involve time division and transferring data among distributed electronics modules via a serial data bus.

(i) List **FOUR (4)** types of automotive network system.

(4 marks)

(ii) Describe the **FOUR (4)** types of automotive network system in term of the type of class, transfer rate, its application.

(12 marks)

(iii) Draw a block diagram to illustrate a simple structure of CAN nodes and LIN nodes configuration in general automotive network system.

(5 marks)

-END OF QUESTIONS -

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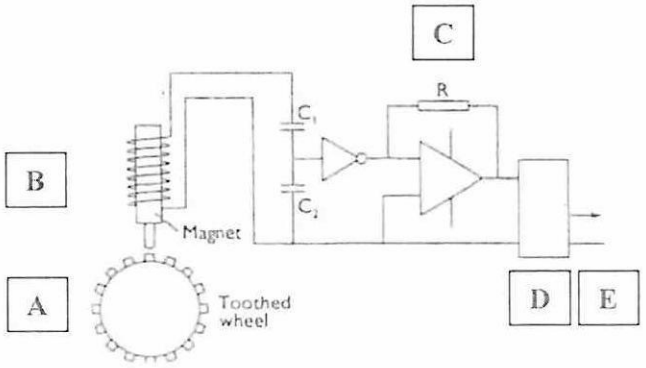

Figure Q2(b)