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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2016/2017**

COURSE NAME : ALTERNATIVE AND ADVANCED FUEL
COURSE CODE : BNG 40403
PROGRAMME CODE : BNG
EXAMINATION DATE : DECEMBER 2016 / JANUARY 2017
DURATION : 2 HOURS 30 MINUTES
INSTRUCTION : ANSWERS ALL QUESTIONS

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THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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- Q1**
- (a) Analyze **SIX (6)** parameters that shall be considered in determining and deciding alternative fuel. (6 marks)
- (b) Combustion of hydrocarbon fuel normally would produces direct and indirect emissions that related to the greenhouse gases. Give **TWO (2)** examples of both direct and indirect greenhouse gases. (2 marks)
- (c) Hydrocarbon is one of the common exhaust emissions in internal combustion engine. Discuss **THREE (3)** main mechanisms that lead to the hydrocarbon emission. (6 marks)
- (d) Properties of alternative fuel may be divided into three main categories that are physical, chemical and thermal properties. List **FOUR (4)** examples of each category. (6 marks)
- Q2**
- (a) Methanol is a good candidate for alternative fuel investigations because of its abundances, physical, and chemical properties. If the methanol used in spark ignition engine, discover **FOUR (4)** important advantages of the methanol as alternative fuel. (4 marks)
- (b) If government decided to use vegetable oil as main source of alternative fuel in diesel engine, analyze **FIVE (5)** main challenges arise that must be tackle and consider enabling the use of vegetable oil. (5 marks)
- (c) In biodiesel production, there are six production methods available to be selected and each method has its advantages. Outline **THREE (3)** advantages of ultrasonic transesterification method and lipase catalyzed transesterification method. (6 marks)
- (d) Kinematic viscosity is one of the important properties of biodiesel production that must be concern.
(i) Define the kinematic viscosity.
(ii) Investigate the effects to the engine if the biodiesel has lower and higher kinematic viscosity. (5 marks)

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- Q3** (a) LPG is one of the alternative fuels that become popular fuel for internal combustion engine. Discover **FIVE (5)** main features of liquefied petroleum gas (LPG) that makes it popular. (5 marks)
- (b) Classify the types of liquefied petroleum gas (LPG) conversion systems and explain clearly the different between each conversion systems. (6 marks)
- (c) Analyze **FOUR (4)** drawbacks of liquefied petroleum gas (LPG) as an alternative fuels for internal combustion engine. (4 marks)
- (d) Autoignition temperature and octane rating of liquefied petroleum gas (LPG) were higher than gasoline while sulfur content was lower as compared with gasoline. Analyze the effects of each stated properties in term of its advantages. (5 marks)
- Q4** (a) Classify the types of compressed natural gas (CNG) storage systems used in compressed natural gas (CNG) vehicles. (3 marks)
- (b) Discover **SIX (6)** benefits of using compressed natural gas (CNG) as an alternative fuel in spark ignition engine. (6 marks)
- (c) Discuss why the usage of alternative fuels generally will lead to the higher nitrogen oxides (NOx) emission as compared to the conventional fuels. (4 marks)
- (d) Theoretically, the use of spark ignition engines with hydrogen produces very few pollutant emissions. List **THREE (3)** methods of fuel delivery system of hydrogen into the spark ignition engines. (3 marks)
- (e) Hydrogen has the potential for use as fuel source for internal combustion engine. However, like other alternative fuels it has its own problems. Investigate **FOUR (4)** critical problems that might be happen. (4 marks)

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- Q5** (a) In order to properly assess the use of electrochemical energy conversion and storage system to power electric vehicle, it is mandatory to quantitatively estimate the power and energy required for propelling the car. Points out **FIVE (5)** main types of power that must be consider. (5 marks)
- (b) Analyze **FIVE (5)** major challenges of electric vehicles as compared to the conventional fuels. (5 marks)
- (c) In designing the solar electric vehicle, there are lots of factor needs to be considered. Discover **FOUR (4)** factors that influence the successful design. (4 marks)
- (d) Analyze **THREE (3)** advantages of using fuel cell for automotive application and **THREE (3)** limitations faced of using this fuel. (6 marks)

- END OF QUESTION -

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