



**UNIVERSITI KUALA LUMPUR
Malaysia France Institute**

**FINAL EXAMINATION
SEPTEMBER 2013 SESSION**

SUBJECT CODE : FVB30803
SUBJECT TITLE : ALTERNATIVE FUEL VEHICLE
LEVEL : BACHELOR
TIME / DURATION : 2.5 Hours
DATE :

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
 2. This question paper is printed on both sides of the paper.
 3. Please write your answers on the answer booklet provided.
 4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
 5. Answer all questions in English.
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THERE ARE 4 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

INSTRUCTION: There are SIX (6) questions. Answer FOUR (4) questions only.

(Total: 100 marks)

Please use the answer booklet provided.

Question 1 (25 marks)

Describe the types of alternative fuel as listed below:

- (a) Dedicated-fuel vehicle. **(5 marks)**
- (b) Mono-fuel vehicle. **(5 marks)**
- (c) Bi-fuel vehicle. **(5 marks)**
- (d) Flex-fuel vehicle (FFV). **(5 marks)**
- (e) Dual-fuel vehicle. **(5 marks)**

Question 2 (25 marks)

A wide variety of alternative fuels are used in markets globally. Explain the vehicle performance characteristics of alternative fuels that are being considered to be used in transportation as listed below:

- (a) Methanol. **(5 marks)**
- (b) Ethanol. **(10 marks)**
- (c) Natural gas. **(10 marks)**

Question 3 (25 marks)

After installing the CNG conversion kits on the vehicles, testing must be conducted. Failure of any test is caused by rejection. Describe some test as listed below:

- (a) Visual Inspection. **(5 marks)**
- (b) Pressure Test. **(5 marks)**
- (c) Electrical Tests. **(5 marks)**
- (d) Gasoline Leak Test. **(5 marks)**
- (e) System Performance Test. **(5 marks)**

Question 4 (25 marks)

(a) The purpose of natural gas fueling systems is to safely and reliably accept fuel from a dispenser, store it, and then deliver it to the engine as required to power the vehicle. Explain four basic operations of onboard fuel storage and delivery systems that must be performed.

(4 marks)

(b) Explain the function of CNG component as listed below:

(i) Fuel Delivery to Engine. **(3 marks)**

(ii) Pressure Regulators. **(3 marks)**

(iii) Piping and Fittings. **(3 marks)**

(iv) Pressure Relief Subsystem. **(3 marks)**

(v) Fuel Container Environmental Protection Subsystem. **(3 marks)**

(vi) Fueling/ Defueling Subsystem. **(3 marks)**

(vii) Gauges/Controls. **(3 marks)**

Question 5 (25 marks)

A fuel cylinder shall be a gas cylinder approved for automotive CNG use, for a rated working pressure of at least 200 bar settle at 15°C for natural gas as a fuel with a maximum filling pressure of 260 bar. Evaluate the damage type of cylinder as shown in the **Figures** below:

(a) Surface Corrosion or Pitting. **(5 marks)**



Figure 1: Corrosion

(b) Fatigue or Stress Corrosion Cracking.

(5 marks)



Figure 2: Stress Corrosion Cracking (SCC)

(c) Surface Cuts and Scratches.

(5 marks)



Figure 3: Cuts

(d) Blunt or Sharp Object Impact Damage.

(5 marks)



Figure 4: Impact Damage

(e) Collision, Fire or Heat Damage.

(5 marks)



Figure 5: Heat Damage

Question 6 (25 marks)

Systematically troubleshoot the following malfunctions on an NGV vehicle.

(a) Engine runs on CNG when rpm is over than 1500 rpm, but dies off during idling.

(5 marks)

(b) Engine runs only on gasoline, but not on CNG.

(5 marks)

(c) Engine cannot start with CNG.

(5 marks)

(d) Engine is knocking when run on CNG

(5 marks)

(e) Engine backfire problem

(5 marks)

END OF QUESTION