



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
SEPTEMBER 2014 SESSION

SUBJECT CODE	:	FVD23104
SUBJECT TITLE	:	ENGINE MANAGEMENT SYSTEM
LEVEL	:	DIPLOMA
TIME / DURATION	:	2.00 PM – 5.00 PM (3 HOURS)
DATE	:	5 JANUARY 2015

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper **CAREFULLY**.
2. This question paper is printed on **ONE** side 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. This question paper consists of **TWO (2)** sections. Section A and B. Answer all questions in Section A. For Section B, answer **TWO (2)** questions only.
6. Answer all questions in **English**.

THERE ARE 7 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)**INSTRUCTION: Answer ALL questions.****Question 1**

Define the roles of the following components which are important in electronic engine control system:

- i. Sensor.
- ii. Electronic control unit.
- iii. Actuator.

(5 marks)

Question 2

- i. List down **FIVE (5)** major types of sensors used to gather inputs on a computerized engine control system.

(5 marks)

- ii. Describe the **THREE (3)** common types of actuator that are used in engine management and control system. Give an example of actuator for each type.

(5 marks)

Question 3

- A. By referring to the figure 1, describe:
 - i. the roles of engine control relay
 - ii. the roles of fuel pump

(5 marks)

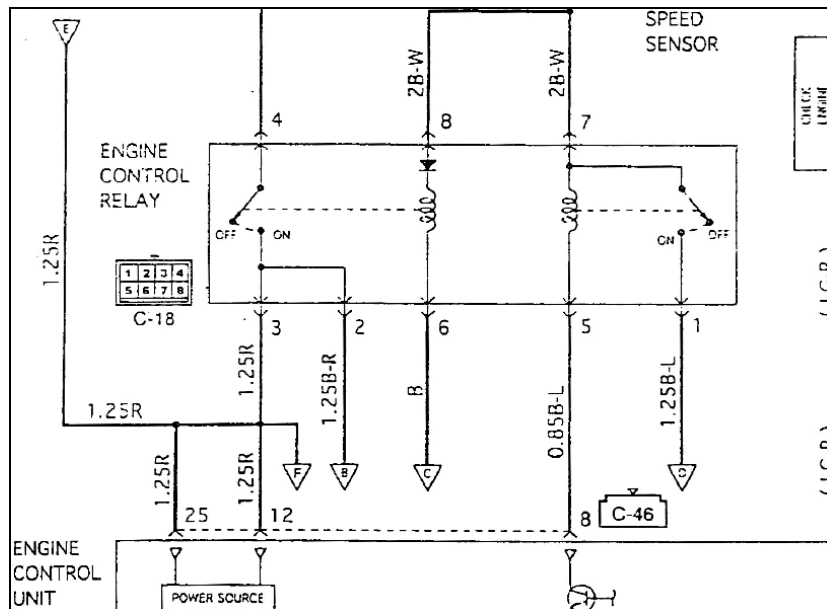


Figure 1: Engine control relay diagram

B. By referring to the figure 2, calculate the theoretical of air fuel ratio:



Figure 2: The combustion process layout of internal combustion engine (Spark Ignition engine)

(5 marks)

Question 4

A. Describe the functions of following sensors:

- i. Air flow meter
- ii. Throttle position sensor

(5 marks)

B. Describe the functions of:

- i. Fuel pressure regulator
- ii. Exhaust gas recirculation (E.G.R)

(5 marks)

Question 5

A. By referring to the figure 3, calculate the injector duty cycle (I.D.C) of the injector during:

- i. Engine speed at 2000 r.p.m.
- ii. Injector pulse width is 1.95 millisecond

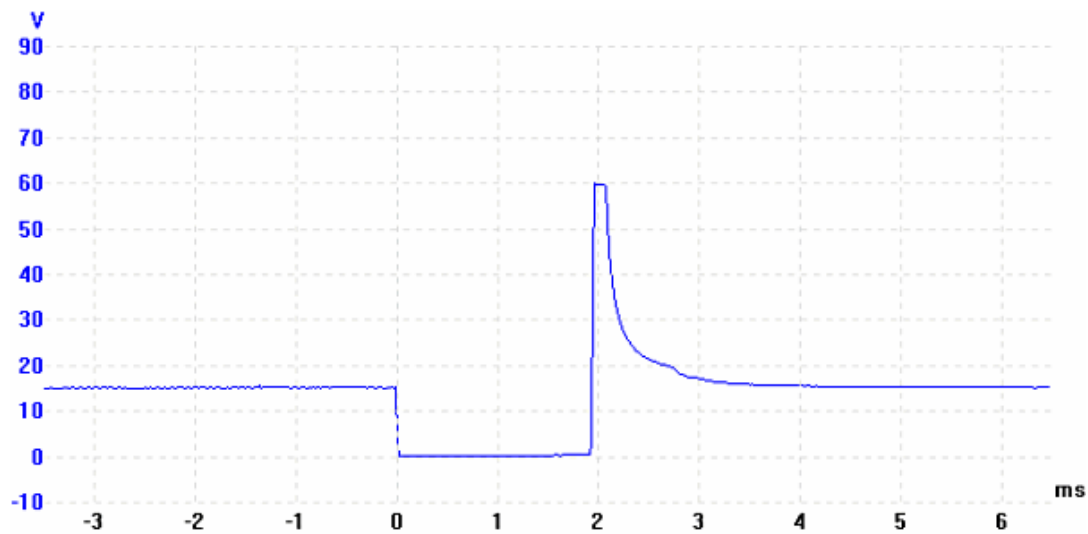


Figure 3: Injector wave pattern signal of typical SI engine

(5 marks)

B. By referring to the figure 4, describe the functions of:

- i. pre catalyst oxygen sensor
- ii. post catalyst oxygen sensor
- iii. catalytic converter (three way type)

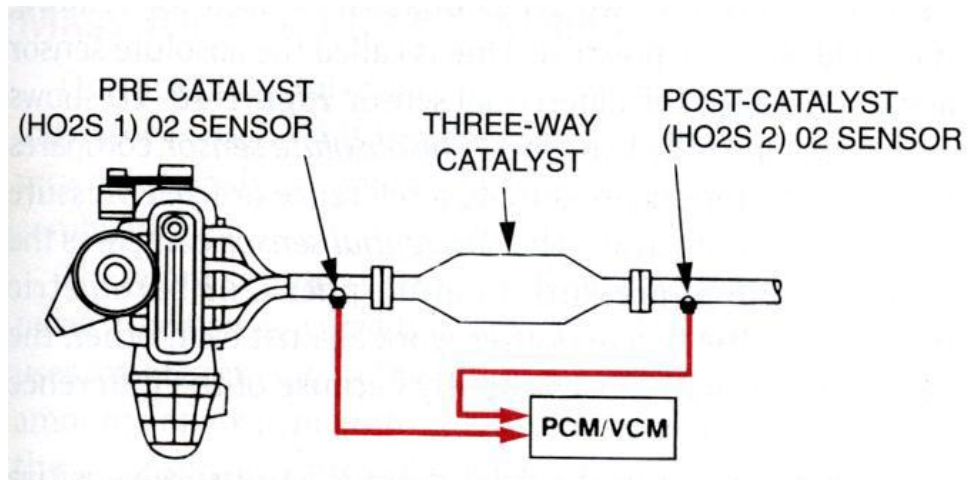


Figure 4: Emission (exhaust) control layout

(5 marks)

Question 6

A. Describe the definition of the engine problem symptoms of the following:

- i. Hesitation sag
- ii. jerking

(5 marks)

B. Describe the effects of harmful gases following to the humans:

- i. H.C
- ii. C.O
- iii. N.O_x

(5 marks)

C. Describe the **FIVE** (5) problem symptoms for an engine to have abnormal condition.

(5 marks)

SECTION B (Total: 40 marks)

INSTRUCTION: INSTRUCTION: Answer only TWO (2) questions in this section.

Question 1

- i. Based on figure 5, explain the operation of oxygen sensor (zirconia type)

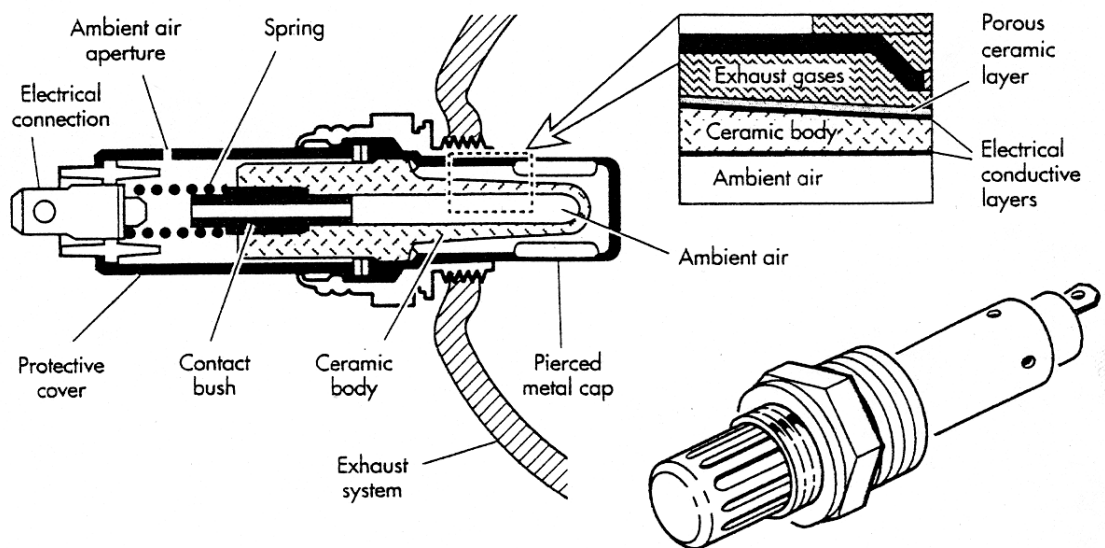


Figure 5: Cross-section of oxygen sensor

(15 marks)

- ii. Describe the characteristic of zirconium (Zr) which is the main construction element in oxygen sensor.

(5 marks)

Question 2

The catalytic converter is vehicle emissions control device that converts toxic pollutants in exhaust gas to less toxic pollutants where it is used in internal combustion engines fueled by petrol or diesel engines. With aid of diagram, describe the type of catalytic converter of the following:

- i. Two-way catalyst.

(10 marks)

- ii. Three-way catalyst.

(10 marks)

Question 3

- i. The ignition timing is calculated as

$$\text{Ignition timing} = \text{Initial advance} + \text{Basic advance} + \text{Correction advance}$$

Explain the following terms:

- a. Initial Advance
- b. Basic Advance and
- c. Correction Advance.

(15 marks)

- ii. Describe the air flow meter (hot wire type) which uses TWO wires such as hot-wire and cold-wire.

(5 marks)

Question 4

- i. Explain the circumstances of abnormal combustion of S.I engine of the following:
- a. Knock
 - b. Surface ignition

(15 marks)

- ii. Calculate the mass of air, M_a (kg/sec) which enter the engine depending on the following condition:

- ✓ Engine speed, $N = 2400$ r.p.m
- ✓ Volume displacement, $V_d = 2000$ centimeter cubic
- ✓ Density of air, $\rho_a = 1.181$
- ✓ Volumetric efficiency, $\eta_v = 91\%$
- ✓ Number of revolution per cycle, $n = 2$

(5 marks)

END OF QUESTION