



**UNIVERSITI KUALA LUMPUR
Malaysia France Institute**

**FINAL EXAMINATION
SEPTEMBER 2014 SESSION**

SUBJECT CODE : FVB40403
SUBJECT TITLE : ENGINE PERFORMANCE ENHANCEMENT
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).

Question 1 (25 marks)

Evaluate how the engine performance can be increased by modifying the engine components as listed below:

- | | |
|---------------------------------------|------------|
| (a) Cylinder Head | (10 marks) |
| (b) Crank Shaft Balancing | (5 marks) |
| (c) Exhaust System Modifying | (5 marks) |
| (d) Engine Management System – tuning | (5 marks) |

Question 2 (25 marks)

The **Figure 1** shows the intake and exhaust valve events as they would typically appear around the end of the exhaust stroke (TDC).

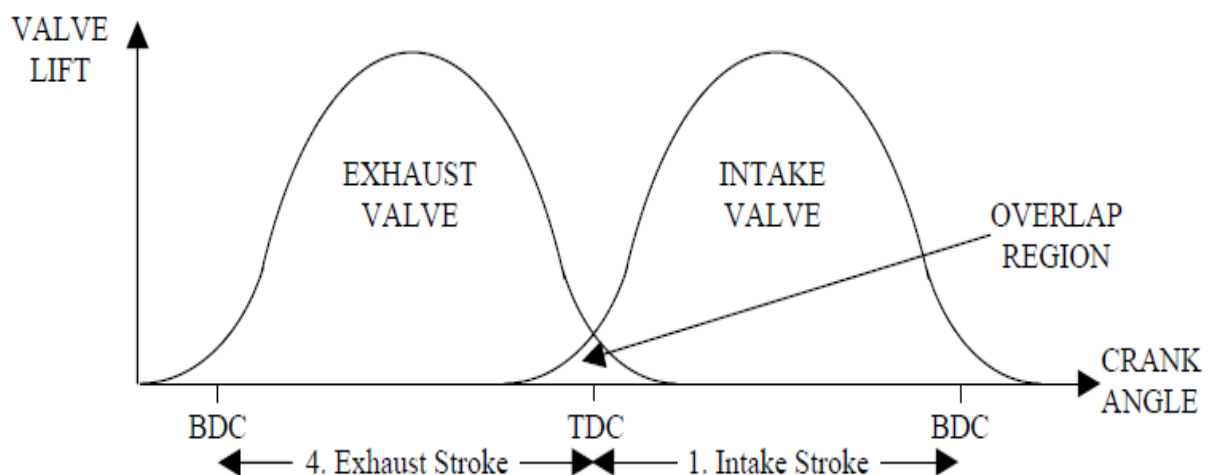


Figure 1

- | | |
|---|-----------|
| (a) Explain the effects of changes to Exhaust Valve Opening Timing – EVO. | (5 marks) |
|---|-----------|

- (b) Describe **THREE (3)** reasons for the ideal timing of Exhaust Valve Opening that must be corrected.
(5 marks)
- (c) Explain the effects of changes for Exhaust Valve Closing Timing – EVC.
(5 marks)
- (d) Describe **THREE (3)** benefits of retaining some of the exhaust gas during part load operation.
(5 marks)
- (e) Explain the effect of changes for Intake Valve Opening Timing – IVO.
(5 marks)

Question 3 (25 marks)

A number of cam shaft are available for an engine. These include:

Table 1

Timing (degree)					
CAM	IO BTDC	IC ABTC	EO BBTC	EC ETDC	LIFT (mm)
Factory	30	60	60	30	9.5
A	26	66	66	26	11.4
B	22	62	62	22	10.3

Discuss the effects of these different cams might have, including duration and overlap effects.

Question 4 (25 marks)

Supercharging is a term used for a process which helps to increase the suction pressure of an IC engine above the atmospheric pressure.

- (a) Explain the requirement of supercharger that need to be fulfilled. (5 marks)
- (b) Describe how a supercharger can raise the engine power output. (10 marks)
- (c) Explain the comparison of actual naturally aspirated and supercharged engine as shown in the **Figure 2** below. (10 marks)

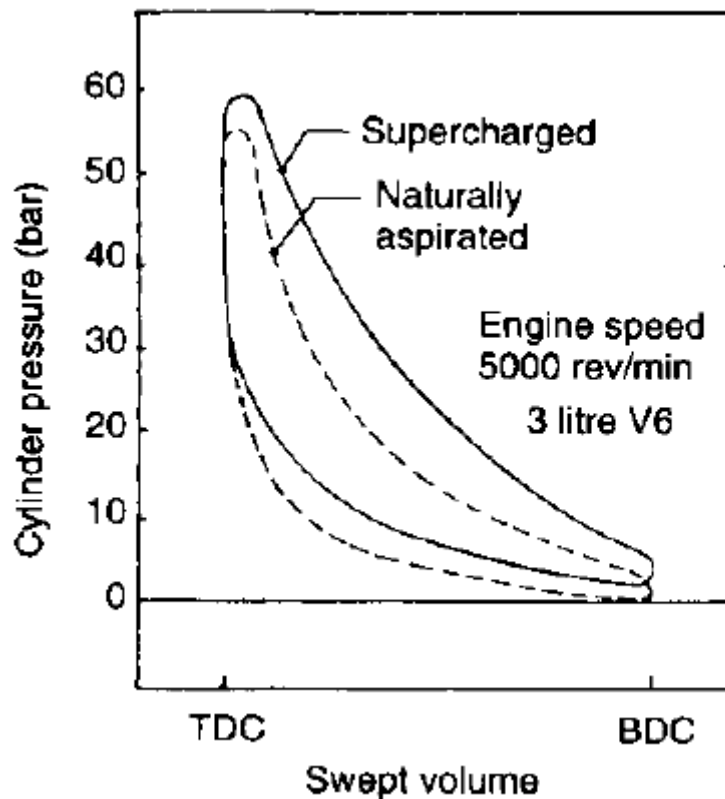


Figure 2

Question 5 (25 marks)

A turbocharger utilizes a portion of the energy contained in the exhaust gas, when it is released by the opening of the exhaust valve towards the end of the power stroke.

- (a) Describe the mechanism of turbocharger.

(5 marks)

- (b) Explain the terms “boost pressure ratio” and “air density ratio”.

(10 marks)

- (c) Air at atmospheric pressure (1 bar) and temperature of 25 °C is drawn into the compressor where it is compressed to a boost pressure and temperature of 0.6 bar and 120 °C respectively. Determine the output density ratio of the compressed and compare this with the ideal value if there was no temperature increase.

Hint:

The charge density: —

(10 marks)

Question 6 (25 marks)

An auto engine has a bore of 90 mm, stroke of 85 mm and compression ratio of 8.5. The engine is rebored to 2 mm oversize.

Calculate:

- (a) Original capacity of the engine.

(5 marks)

- (b) Percentage increase in capacity due to reboring.

(5 marks)

- (c) Compression ratio after reboring.

(5 marks)

- (d) Air standard efficiency (before and after reboring).

(5 marks)

- (e) Discuss all the calculation results.

(5 marks)

END OF QUESTION