



**UNIVERSITI KUALA LUMPUR  
Malaysia France Institute**

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**FINAL EXAMINATION  
JULY 2010 SESSION**

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**SUBJECT CODE** : FVB 20402  
**SUBJECT TITLE** : ENGINE TECHNOLOGY 2  
**LEVEL** : BACHELOR  
**TIME / DURATION** : 9.00am – 11.00am  
( 2 Hours )  
**DATE** : 11 NOVEMBER 2010

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**INSTRUCTIONS TO CANDIDATES**

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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 questions paper consists of **FIVE (5)** questions. Answer **FOUR (4)** questions only.
  6. Answer all questions in English.
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**THERE ARE 3 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.**

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**INSTRUCTION: There are 5 (five) questions. Answer 4 (four) questions only.**

**(Total: 100 marks)**

**Please use the answer booklet provided.**

### Question 1

A four stroke Otto cycle engine has the following data:

Piston diameter (bore) = 13.7 cm

Length of stroke = 13.0 cm

Clearance volume = 14.6 % of swept volume

a) Draw P-V diagram

(5 marks)

b) Calculate the air standard efficiency

(20marks)

### Question 2

An ideal 3540 cc diesel engine has a stroke to bore ratio of 4:3. The clearance volume is 10 % of the swept volume.

a) Draw P-V diagram

(5 marks)

b) Find the diameter and stroke of the engine

(5 marks)

c) Calculate the compression ratio

(5 marks)

d) Calculate the air standard efficiency if cut-off takes place at 6% of stroke

(10 marks)

### Question 3

A four stroke diesel engine has stroke volume 2400 cc and produces 12 kW per  $\text{m}^3$  of free air inducted per minute. The speed is 3500 rpm and the volumetric efficiency is 0.82. The

ambient conditions are: the pressure 1 bar and the temperature 300 K. A supercharger is introduced in the system to raise the pressure to 1.8 bar with an isentropic efficiency of 0.8.

- a) Calculate the output of the engine without supercharger.  
(10 marks)
- b) Calculate the output of the engine with supercharger.  
(10 marks)
- c) Calculate the increase of the output of the engine.  
(5 marks)

#### Question 4

A four stroke, eight-cylinder engine of 9 cm bore and 8 cm stroke with a compression ratio 7 is tested at 4500 rpm on a dynamometer which has 54 cm arm. During a 10 minutes test the dynamometer scale beam reading was 412.02 N and the engine consumed 4.4 kg of gasoline having a calorific value of 44,000 kJ/kg. Air at 27 °C and 1 bar was supplied to carburetor at the rate of 6 kg/min.

Calculate:

- a) The brake power developed  
(3 marks)
- b) Brake mean effective pressure  
(3 marks)
- c) Brake specific fuel consumption  
(3 marks)
- d) Brake specific air consumption  
(3 marks)
- e) Brake thermal efficiency  
(3 marks)
- f) Volumetric efficiency  
(7 marks)
- g) Air fuel ratio.  
(3 marks)

#### Question 5

A five-cylinder, in-line engine has an 8.15 cm bore, a 7.82 cm stroke, and a connecting rod length of 15.4 cm. Each piston has a skirt length of 6.5 cm and a mass of 0.32 kg. At a certain engine speed and crank angle, the instantaneous piston speed is 8.25 m/sec, and clearance between the piston and cylinder wall is 0.004 mm. SAE 10-30 W motor oil is used in the engine, and at the temperature of the piston-cylinder interface the dynamic viscosity of the oil is 0.006 N-sec/m<sup>2</sup>. Calculate the friction force on one piston at this condition.

(25 marks)

**END OF QUESTION**