



**UNIVERSITI KUALA LUMPUR
Malaysia France Institute**

**FINAL EXAMINATION
SEPTEMBER 2014 SESSION**

SUBJECT CODE : FVB21403
SUBJECT TITLE : INTERNAL COMBUSTION ENGINE
LEVEL : BACHELOR
TIME / DURATION : 9.00 AM – 12.00 PM
(3 HOURS)
DATE : 7 JANUARY 2015

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.
 6. This question paper consists of **TWO (2)** sections. Answer **ALL** questions in section A and for section B, answer only **THREE (3)** questions.
 7. **OPEN BOOK**
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THERE ARE 3 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)**INSTRUCTION: Answer All Questions.****Please use the answer booklet provided.****Question 1**

Determine how the tetra –ethyl lead (TEL) can improves the quality of fuel for SI engine.

(4 marks)**Question 2**

Explain the octane number 80 and cetane number 75.

(4 marks)**Question 3**

Describe the effects of volatility in term of engine condition.

(4 marks)**Question 4**

Compressed natural gas (CNG) is preferable in SI engine than CI engine. Justify the statement.

(4 marks)**Question 5**

Explain the effects of fuel viscosity on diesel engine performance.

(4 marks)**Question 6**

Explain the various effects of the engine friction for: (i) stroke-bore ratio, (ii) engine size, (iii) piston rings, (iv) compression ratio, and (vi) journal bearings.

(4 marks)**Question 7**

Explain how the engine efficiency varies with load.

(4 marks)

Question 8

Determine the causes of blow by losses.

(4 marks)

Question 9

Explain the importance of the engine cooling to keep the temperature of the engine low.

(4 marks)

Question 10

Explain the relation of the volumetric efficiency to the power output of the engine.

(4 marks)

SECTION B (Total: 60 marks)

INSTRUCTION: Answer THREE (3) Questions.

Please use the answer booklet provided.

Question 11

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.

(15 marks)

Question 12

An ideal Diesel cycle has the following dimensions:

Bore = 15 cm

Stroke = 25 cm

Clearance volume = 400 cc.

The fuel injection takes place at constant pressure for 5 % of the stroke.

a) Draw P-V diagram.

(3 marks)

b) Calculate the compression ratio.

(3 marks)

c) Calculate the air standard efficiency.

(4 marks)

d) Identify the loss in efficiency if the cut-off is delayed from 5 % to 8 % of the stroke.

(10 marks)

Question 13

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. **(2 marks)**
- b) Brake means effective pressure. **(3 marks)**
- c) Brake specific fuel consumption. **(2 marks)**
- d) Brake specific air consumption. **(2 marks)**
- e) Brake thermal efficiency. **(2 marks)**
- f) Volumetric efficiency. **(7 marks)**
- g) Air fuel ratio. **(2 marks)**

Question 13

A road test was made on a 4-cylinder car moving at a speed of 50 km/hr. The fuel consumption was 1.8 liters while the car covered a distance of 5 km. The other data were: Cylinder bore 80 mm, stroke 90 mm, engine to rear axle ratio: 8 : 1, and wheel diameter with tyre fully inflated = 0.65 m. The estimated mean effective pressure was 6 bars. Calculate the indicated power and indicated thermal efficiency. Take LHV = 44 MJ/kg; special gravity of fuel = 0.8.

(20 marks)

END OF QUESTIONS