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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

SEPTEMBER 2014 SESSION

SUBJECT CODE	:	**FVB40903**
SUBJECT TITLE	:	**AUTOMOTIVE MATERIALS**
LEVEL	:	**BACHELOR**
TIME / DURATION	:	**3.00 PM – 5.00 PM (2 HOURS)**
DATE	:	**9 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.**

THERE ARE 3 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

In converting the linear motion of the piston into rotational motion, crankshafts operate under high loads and require high strength.

(a) Explain the performance requirements. (10 marks)

(b) Explain the manufacturing requirements. (8 marks)

(c) Explain the materials selection. (7 marks)

Question 2

A connecting rod is generally abbreviated to con-rod. The crankshaft con-rod mechanism transforms the reciprocative motion to rotational motion. The con-rod connects the piston to the crankshaft to transfer combustion pressure to the crankpin.

(a) Explain the performance requirements. (10 marks)

(b) Explain the materials requirements. (8 marks)

(c) Explain the materials selection. (7 marks)

Question 3

A piston must carry out the pressures created by the ignition of the fuel and air mixture transferring these forces via the wristpin and the connecting rod to the crankshaft, and, in addition, providing guidance for the small con-rod eye.

(a) Explain the performance requirements. (5 marks)

(b) Explain how to improve slip properties. (10 marks)

(c) Explain how to improve thermal protection. (10 marks)

Question 4

An engine block is the component that encloses the cylinders, the cooling jacket, and the engine block shell.

(a) Explain the primary functions that the engine block fulfills. (7 marks)

(b) **Figure 1** shows the graphite shape in cast iron. Explain:

(i) Flaky graphite. (6 marks)

(ii) Spheroidal (nodular) graphite. (6 marks)

(iii) Compacted (vermicular) graphite. (6 marks)

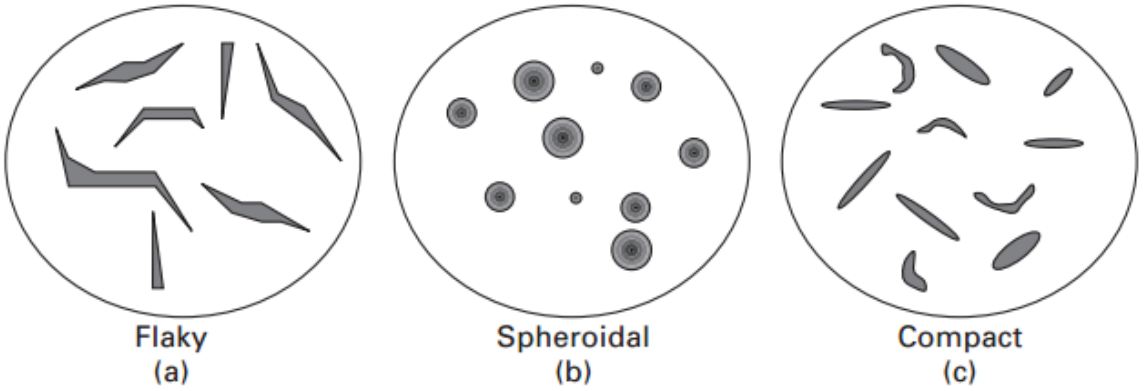

Figure 1

Question 5

Piston rings are metallic gaskets which functions are to seal the combustion chamber against the crankcase, to transmit heat from the piston to the cylinder wall, and to regulate the amount of oil present on the cylinder sleeve.

(a) Explain the shaping process for:

(i) Tandem turning. (5 marks)

(ii) Winding. (5 marks)

(b) Explain wear protection by:

(i) Plasma spatter layer. (5 marks)

(ii) Chrome-ceramic layer. (5 marks)

(iii) Nitriding and nitrocarburizing. (5 marks)

Question 6

Combustion gases in four-stroke engines are controlled by the valve mechanism, a complex structure, often referred to as a valve train, of which the camshaft is an integral part.

(a) Explain the primary functions that the camshaft fulfills. (5 marks)

(b) Explain the flaking phenomenon. (10 marks)

(c) Explain the pitting phenomenon. (10 marks)

END OF QUESTION