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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

SEPTEMBER 2014 SESSION

SUBJECT CODE	:	**FVB20903**
SUBJECT TITLE	:	**ENGINEERING SCIENCE 1**
LEVEL	:	**BACHELOR**
TIME / DURATION	:	**3.30 PM – 6.30 PM (3 HOURS)**
DATE	:	**08 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. For section B, answer only THREE (3) questions.**
7. ***OPEN BOOK***

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

(a) An office worker claims that a cup of cold coffee on his table warmed up to 80 ^{0}C by picking up energy from the surrounding air, which is at 25 ^{0}C. Explain whether this is a true statement and whether these processes violate any thermodynamic laws.

(4 marks)

(b) A large fraction of the thermal energy generated in the engine of a car is rejected to the air by the radiator through the circulating water. Explain whether the radiator should be analyzed as a closed system or as an open system.

(4 marks)

(c) For a system to be in thermodynamic equilibrium, identify whether the temperature and the pressure have to be the same everywhere.

(4 marks)

(d) It is well known that warm air in a cooler environment rises. Now consider a warm mixture of air and gasoline on top of an open gasoline can , explain if this gas mixture will rise in a cooler environment.

(4 marks)

(e) The kinetic energy of a fluid increases as it is accelerated in an adiabatic nozzle. Describe the source of energy.

(4 marks)

Question 2

(a) Explain why the throttling devices are commonly used in refrigeration and air conditioning applications.

(4 marks)

(b) A mechanic claims to have developed a car engine that runs on water instead of gasoline. Explain your response to this claim.

(4 marks)

(c) In a refrigerator, heat is transferred from a lower temperature medium (the refrigerated space) to a higher temperature one (the kitchen air). Explain whether this violation of the second law of thermodynamics.

(4 marks)

(d) It is well known that the power consumed by a compressor can be reduced by cooling the gas during compression. Inspired by this, somebody proposes to cool the liquid as it flows through a pump in order to reduce the power consumption of the pump. Explain how you support or decline this proposal.

(4 marks)

(e) Consider two houses that are identical, except that the walls are built using bricks in one house, and wood in the other. If the walls of the brick house are twice as thick, explain which house that is more energy efficient.

(4 marks)

SECTION B (Total: 60 marks)

INSTRUCTION: Answer THREE (3) Questions.

Please use the answer booklet provided.

Question 3

(a) A car of mass 1775 kg travels with a velocity of 100 km/hr. Calculate the kinetic energy. Determine how high the car should be lifted in the standard gravitational field to have a potential energy that equals the kinetic energy.

(10 marks)

(b) A 1.2 tons car moving at 20 km/hr is accelerated at a constant rate of 4 m/s^2 up to a speed of 75 km/hr. Calculate the forces and total time required.

(10 marks)

Question 4

A gasoline engine in a large truck takes in 10,000 J of heat and delivers 2000 J of mechanical work per cycle. The heat is obtained by burning gasoline with heat of combustion $L_c = 5.0 \times 10^4$ J/g.

(i) Determine the thermal efficiency of this engine.

(ii) Calculate the heat discarded in each cycle.

(iii) Calculate the gasoline burned in each cycle.

(iv) If the engine goes through 25 cycles per second, calculate its power output in watts, and in horsepower.

(v) Determine how much gasoline burned per second, and per hour.

(20 marks)

Question 5

The pressure in an automobile tire depends on the temperature of the air in the tire. When the air temperature is 25 ^{0}C, the pressure gage reads 210 kPa. If the volume of the tire is 0.025 m^3, determine the pressure rise in the tire when the air temperature in the tires rises to 50 ^{0}C. Also, determine the amount of the air that must be bled off to restore pressure to its original value at this temperature. Assume the atmospheric pressure is 100 kPa.

(20 marks)

Question 6

Car radiators are single-pass crossflow heat exchangers with both fluids unmixed. Water at 0.05 kg/s enters the tubes at 125 °C and leaves at 55 °C. Air enters the heat exchanger at 35 m^3/min, 25 °C, and 97 kPa. The overall heat transfer coefficient is 225 W/m^2·K. Determine the required heat transfer area (in m^2).

(20 marks)

Question 7

At highway speeds, about half of the power generated by the car engine is used to overcome aerodynamics drag, thus the fuel consumption is nearly proportional to the drag force on a level road. Determine the percentage increase in fuel consumption of the car per unit time when a person who normally drives at 90 km/hr starts driving at 120 km/hr.

(20 marks)

END OF QUESTIONS