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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020**

COURSE NAME : ENVIRONMENTAL PHYSICS
COURSE CODE : BWC 30603
PROGRAMME CODE : BWC
EXAMINATION DATE : DECEMBER 2019 / JANUARY 2020
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

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THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

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- Q1** (a) Explain in detail why fossil has become one of the important resource for energy production around the world. (4 marks)
- (b) The development of Malaysia's energy flows is influence by **FOUR (4)** key factors. List and explain in detail all of these factors. (8 marks)
- (c) (i) There are many types of renewable energy, which are including solar, biomass, wind, hydro and geothermal energy. Give the advantages and disadvantages of all these renewable energy resources. (4 marks)
- (ii) From **Q1(c)(i)**, please give a suggestion for the best renewable energy resources for Malaysia. Justify your answer. (4 marks)
- Q2** (a) The mechanism of Carnot engine on the variable of P and V is shown in **Figure Q2(a)**. Give the name of the process occurred at 1-2, 2-3, 3-4 and 4-1. Explain the changing of P and V for each process. (6 marks)
- (b) 1 gram of water is placed in the cylinder and the pressure is maintained at 2.0×10^5 Pa. The temperature of the water raised by 31°C . The water is in the liquid phase and expands by the small amount of 1.0×10^{-8} m³. Find the work done and the change in internal energy. (Hint: use $Q = mc\Delta\theta$ and specific heat of water, $c_{\text{water}} = 4186 \text{ Jkg}^{-1}\text{K}^{-1}$) (6 marks)
- (c) An automobile engine shown in **Figure Q2(c)** has an efficiency of 22.0% and produces 2510 J of work. Estimate the amount of heat is rejected by the engine? (8 marks)
- Q3** (a) (i) Define the terms of energy storage.
- (ii) Explain in detail the mechanism of energy storage for photovoltaic (PV) energy. (6 marks)
- (b) Three types of insulator material **A**, **B** and **C** with a similar thickness have a thermal resistance value, R as tabulated in **Table Q3(b)**.

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Table Q3(b): *R* value per cm for material A, B and C

<i>R</i> value per cm		
A	B	C
5.0	7.0	6.3

According to Table Q3(b);

- (i) Construct a sequence order of these materials from lower to higher quality of insulator properties.
 - (ii) Propose the best material for heat energy storage. Justify your answer. (6 marks)
- (c) A wall of the house consists of plywood backed by insulation. The thermal conductivities of the insulation and plywood are 0.030 and $0.080 \text{ Wm}^{-1}\text{K}^{-1}$ respectively and the area of the wall is 35 m^2 as illustrated in Figure Q3(c). Calculate,
- (i) the temperature at the interface, *T*.
 - (ii) the amount of heat conducted through the wall in one hour. (8 marks)
- Q4**
- (a)
 - (i) Solar energy technology techniques can be divided into **TWO (2)** categories. Explain each of the categories.
 - (ii) Explain the mechanism of electrons and holes production at *P-N* junction in solar panel. Provide your answer with appropriate schematic diagram. (6 marks)
 - (b) The existence of the Greenhouse Effect (GE) was argued for by Joseph Fourier in 1824. The argument and the evidence was further strengthened by Claude Pouillet in 1827 and 1838.
 - (i) Define the Greenhouse Effect (GE)?
 - (ii) Explain in detail GE mechanism in the atmosphere and the effect to the climate change. (6 marks)
 - (c) Assume that the sun is a sphere of radius $6.96 \times 10^8 \text{ m}$ and that its surface temperature is $5.8 \times 10^3 \text{ K}$. If the sun radiates at a rate of $3.90 \times 10^{26} \text{ W}$ and consider as a perfect emitter, at what rate is the energy emitted per square meter at the sun's surface? [Given: Stefan-Boltzmann constant, $\sigma = 5.67 \times 10^{-8} \text{ J}/(\text{s} \cdot \text{m}^2 \cdot \text{K}^4)$] (8 marks)

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- Q5** (a) (i) Define a nuclear reactor? (2 marks)
- (ii) List all main components of nuclear reactor. Explain the function of each component. (6 marks)
- (iii) Distinguish between pressurized water reactor (PWR) and boiling water reactor (BWR). (6 marks)
- (b) A catastrophic nuclear accident occurred at Chernobyl, Russia on 26 April 1986. An explosion and fire released large quantities of radioactive particles into the atmosphere, which spread over much of the western Russia and Europe. Analyze the causes of this accident and the effect to environment and eco-system. (6 marks)

- END OF THE QUESTIONS -

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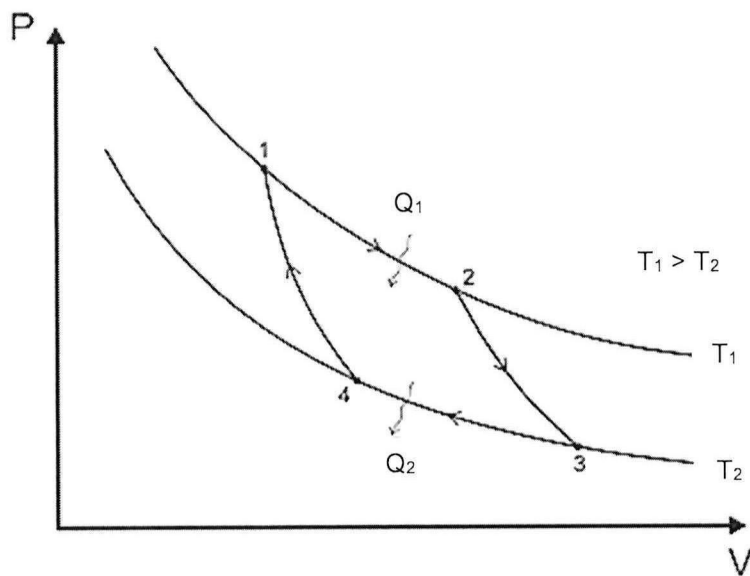


Figure Q2(a)

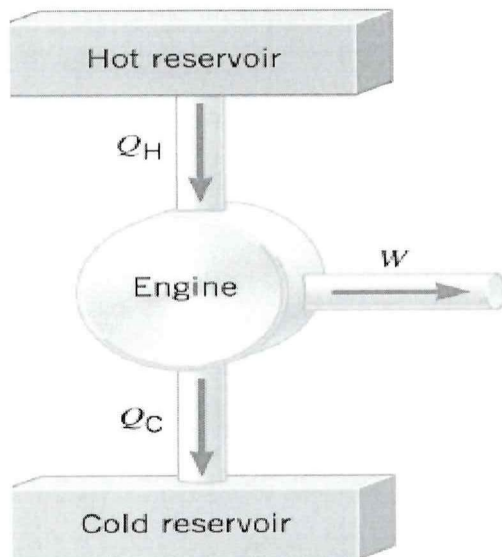


Figure Q2(c)

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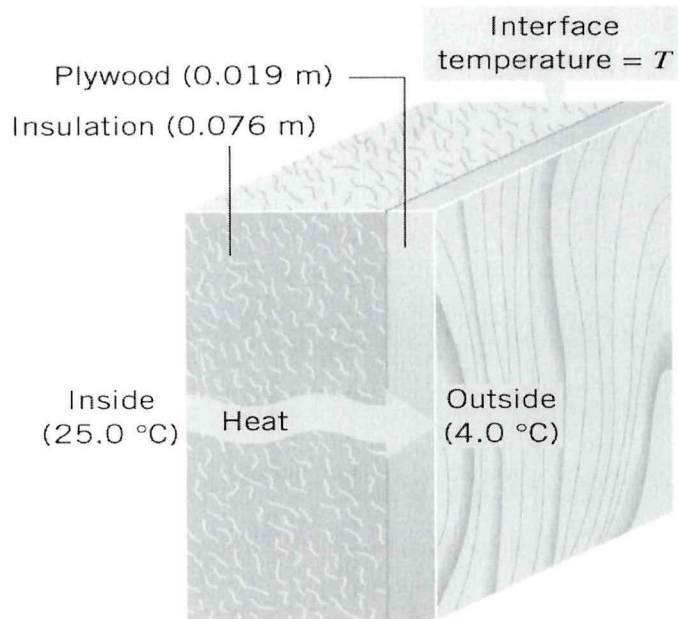


Figure Q3(c)

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